New Approaches In Educational Software

COMPUTE!'s GAZETTE

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October 1984
Issue 16 Vol. 2, No. 10
02220 $3.75 Canada

For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers

BASIC Magic

A new column for beginners that explores BASIC with a fresh start—from former Commodore computer designer Michael Tomczyk.

Quiz Master

An easy-to-use multiple-choice quiz generator for parents and teachers. For the Commodore 64.

Trek

Look out for drones, craggy mountain peaks, and the deadly plasma cannon in this sci-fi action game for the 64.

Turtle Graphics Interpreter

Full turtle graphics capabilities without LOGO? Try this three-program package for the Commodore 64.

How GAZETTE Readers Are Using Their Computers

You may get some new ideas for using your VIC or 64 after seeing what other GAZETTE readers are doing with their computers at home, in school, and in business.

Also In This Issue:

Vocab Builder For The VIC And 64

Inside View: Tom Snyder, Educational Software Developer

VIC Music Tutor

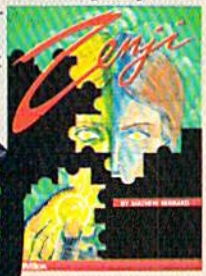
Plus Reviews, Games, And New Products

INTRODUCING ACTIVISION

SEE YOURSELF IN A

You leave the sun behind as you lower yourself down into the unexplored caverns beneath the Peruvian jungle. Deeper and deeper you go. Past Amazon frogs, condors, and attacking bats. Across eel-infested underground rivers. From cavern to cavern, level to level. Swimming, running, dodging, stumbling, you search for the gold, the Raj diamond and the thing you really treasure...adventure. Head for it. Designed by David Crane.

You have heard the elder speak of one central source and a maze of unconnected grey paths. As you connect each grey path to the central source, what was grey becomes the green of life. When all are connected, then you have achieved "Zenji." But beware the flames and sparks of distraction that move along the paths. You must go beyond strategy, speed, logic. Trust your intuition. The ancient puzzle awaits. Designed by Matthew Hubbard.



You strap on your helicopter prop-pack, check your laser helmet and dynamite. There's no predicting what you'll have to go through to get to the trapped miners. Blocked shafts, molten lava, animals, insects, who knows what lies below. But you'll go, you're in charge of the Helicopter Emergency Rescue Operation. The miners have only one chance. You. The opening shaft is cleared now, it's time to go. Designed by John Van Ryzin.

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FOR YOUR COMMODORE 64.

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You made it. The Olympics. You hear languages you've never heard. And the universal roar of the crowd. You will run. Hurl. Vault. Jump. Ten events. One chance. You will push yourself this time. Further than ever. Harder than ever. But then . . . so will everyone. The competition increases, now two can compete at the same time. The crowd quiets. The starting gun sounds. A blur of adrenalin. Let the games begin. Designed by David Crane.

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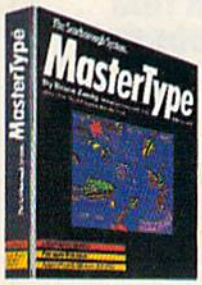

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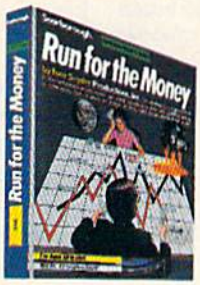

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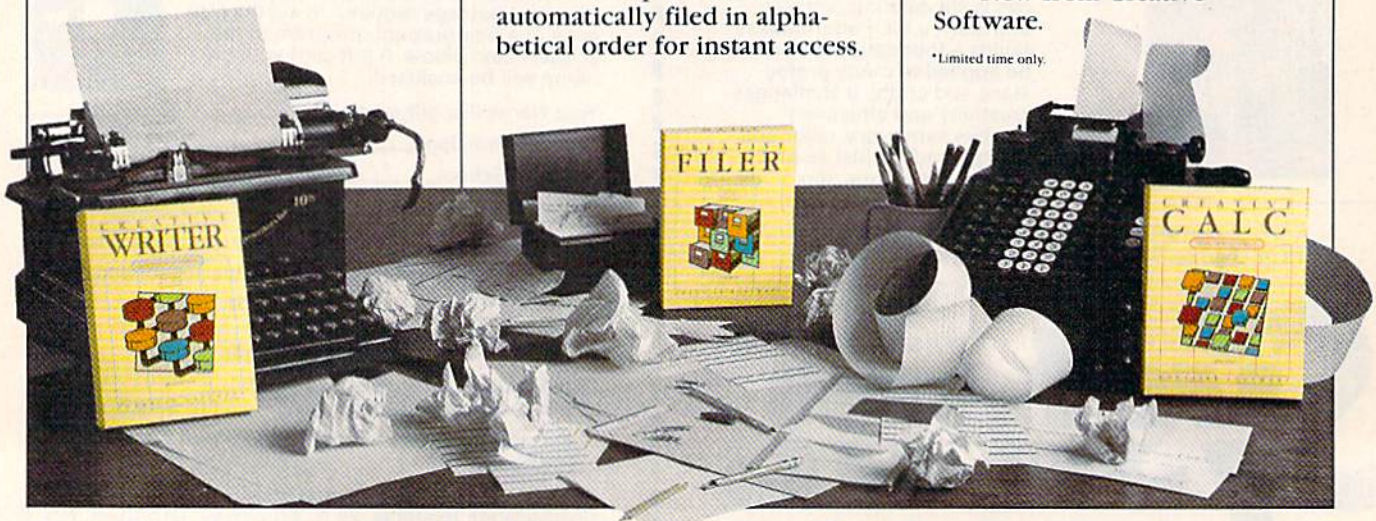

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*=General, **V**=VIC-20, **64**=Commodore 64.

COMPUTE!'s GAZETTE is published monthly by **COMPUTE!** Publications, Inc., Post Office Box 5406, Greensboro, NC 27403 USA. Phone (919)275-9809. Editorial offices are located at 324 West Wendover Avenue, Greensboro, NC 27408. Domestic subscriptions: 12 issues, $24! Send subscription orders or change of address (P.O. Form 3579) to Circulation Dept., *COMPUTE!'s GAZETTE*, P.O. Box 961, Farmingdale, NY 11737. Second class application pending at Greensboro, NC 27403 and additional mailing offices. Entire contents copyright © 1984 by **COMPUTE!** Publications, Inc. All rights reserved. ISSN 0737-3716.

COMPUTE! Publications, Inc., One of the ABC Publishing Companies: ABC Publishing, President, Robert G. Burton; 1330 Avenue of the Americas; New York, New York 10019.

THE EDITOR'S *notes*

GAZETTE *Editor Lance Elko contributes a guest editorial this month on current events at Commodore and welcomes a new* GAZETTE *columnist.*

Robert Lock, Editor In Chief

One can wonder where Commodore is now headed. After selling its Santa Clara manufacturing center and closing its Dallas research and development plant (speech technology, robotics, and sound), there's been more than a little speculation about Commodore selling out to a larger firm.

Amid rumblings that RCA, GE, ITT, and AT & T could be prospective buyers, only the AT & T rumor appears to have any substance. But, no immediate cause for alarm, says one Commodore source—although Commodore and AT & T have been talking, nothing significant has developed and probably won't over the next few months.

If this isn't enough to keep things buzzing at Commodore, there's also Jack Trameil's purchase of Atari. Although Trameil hired away Commodore's national accounts representative and vice-president of operations, among others, Commodore claims it doesn't feel threatened by its founder and former chairman. In response, several key Commodore staff persons have said they welcome the competition ("Jack is unpredictable") and the incentive.

The Plus/4s and Commodore 16s should be on the market as you read this. The manuals have been completed, and Commodore reports a lot of dealer orders, especially for the Plus/4.

Currently available is the Educator 64, which is a 64 and a monochrome (green screen) monitor housed in a PET case. It's available only through Commodore Education dealers.

Although Commodore announced that the MCS-801 dot-matrix printer was cancelled, they are moving ahead on the DPS-1101, a letter-quality printer which will sell in the $200–$300 range.

A New Column For Beginners

Since the GAZETTE's premier in July 1983, we've grown considerably in magazine size, readership, and in our reader-shared knowledge of computing. Our evolution has been a kind of mutual cause-and-effect relationship with our readers and will continue to be so. But what about our newer readers? We've heard from several who have just brought their first computer home and are understandably befuddled.

Beginning this month, we have a new column, BASIC Magic, for beginners. Michael S. Tomczyk, a former Commodore product designer and writer, will be teaching BASIC from scratch and will offer a lot of simple one- and two-line programs so you can see what's going on inside your computer almost immediately. If you're new to computing, you'll find this column very helpful. It assumes you know only how to switch your computer on.

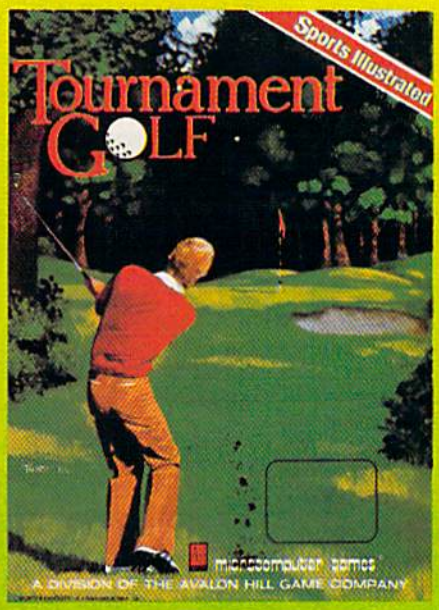
BASIC Magic will replace C. (Cheryl) Regena's Beginner's Corner. Cheryl will continue her association and work with the GAZETTE and all other COMPUTE! Publications.

Until next month, enjoy your GAZETTE.

Lance Elko
Editor

Tee off with Tournament GOLF

Sports Illustrated™



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COMPUTE! Publications, Inc., publishes
COMPUTE! ***COMPUTE! Books*** ***COMPUTE!'s GAZETTE***
COMPUTE!'s PC & PCjr Magazine

Corporate Office:
324 West Wendover Ave., Suite 200, Greensboro, NC 27408
Mailing Address:
Post Office Box 5406, Greensboro, NC 27403
Distribution Center
505 Edwardia Drive, Greensboro, NC 27409
Telephone: 919-275-9809
Office Hours: 8:30 AM to 4:30 PM Monday–Friday

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Subscription Information

COMPUTE!'s GAZETTE Circulation Dept.
P.O. Box 5406, Greensboro, NC 27403

TOLL FREE
Subscription Order Line
800-334-0868
In NC 919-275-9809

COMPUTE!'s GAZETTE
Subscription Rates

(12 Issue Year): US (one year) $24. Canada, Mexico and Foreign Surface Mail $30. Foreign Air Mail $45.

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GAZETTE FEEDBACK

Editors And Readers

Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.

Note To Readers

Program 2("Change Disk ID") of last month's "Disk Tricks" does not work as expected. The article correctly described the difficulties caused by duplicate IDs. However, when a disk is newly formatted, using the NEW0: command, the ID is written to every track and sector. The Change Disk ID program changes only the header, which does not solve the problems of duplicate IDs. For more information, see this month's Bug-Swatter.

Incompatible Disk Drives

Members of our user group are experiencing problems when trading diskettes. Some disks will not run, save, etc. on different disk drives. I believe this is caused by different disk drive speeds.

Is there a program that will continuously display the disk drive speeds while it is running?

E2C ComCats

All 1541 disk drives should run at the same speed: 300 rpm. It's possible that a drive or two in your users' group is experiencing a hardware problem, but speed is probably not the cause of your incompatibility problem.

More than likely, the problem stems from differences between the drives in the READ/WRITE head's alignment. Earlier models of the 1541 had problems with the step-motor mechanism (which positions the READ/WRITE head) slipping out of adjustment.

A quick way to tell if your drive might be out of alignment is by watching the red light on the front of the drive. A good rule of thumb is that when loading a program, the red light should stay on without any blinking. If it starts to blink (other than the steady blinking caused by a DOS error), it could be having trouble reading the diskette. When you run this test, be sure to use a good quality commercial diskette. If your drive is out of alignment, take it to your local Commodore dealer for repairs. (Also see the review of CSM's 1541 disk drive alignment software elsewhere in this issue.)

Quick Diskette Erasing

I wish to erase a diskette with a bulk demagnetizer. Is it harmful to use this method to erase a diskette?

Also, what is the formula for figuring out how many bytes a program uses (in the computer) by the blocks used on the disk directory?

Michael Montgomery

According to a representative from a major diskette manufacturing company, using bulk erasers won't harm the diskette. He noted that each box of diskettes manufactured at this company is bulk erased (by exposure to a strong magnetic field) as it leaves the assembly line.

Theoretically, a diskette can be erased an infinite number of times. Wear is caused by the disk drive's READ/WRITE head making contact with the diskette, not by the changes in the magnetic fields.

To get an estimate of the amount of memory used by a program, divide the number of blocks used (to the left of the program name) by 4 to get the number of K used, or multiply by 254 to get the number of bytes.

Each sector on a 1540 or 1541 diskette has 256 bytes. Two of the bytes are used by the computer, and the other 254 are used to store the program. This is why you divide by 4 to give you the amount of memory in 1K blocks, or multiply by 254 to get the total number of bytes used. For example, a program that uses 50 blocks on a diskette is approximately 12.5K (50 ÷ 4) or 12,700 bytes long (254 × 50).

Dirty Cartridges

I have a few cartridges on which the gold contacts have turned black after a few uses. Is it safe to periodically clean the contacts? Would it be better to just let them get black? I've been told that this is harmful to the cartridge.

Terry Kulchyski

It's a good idea to keep the contacts clean, and this

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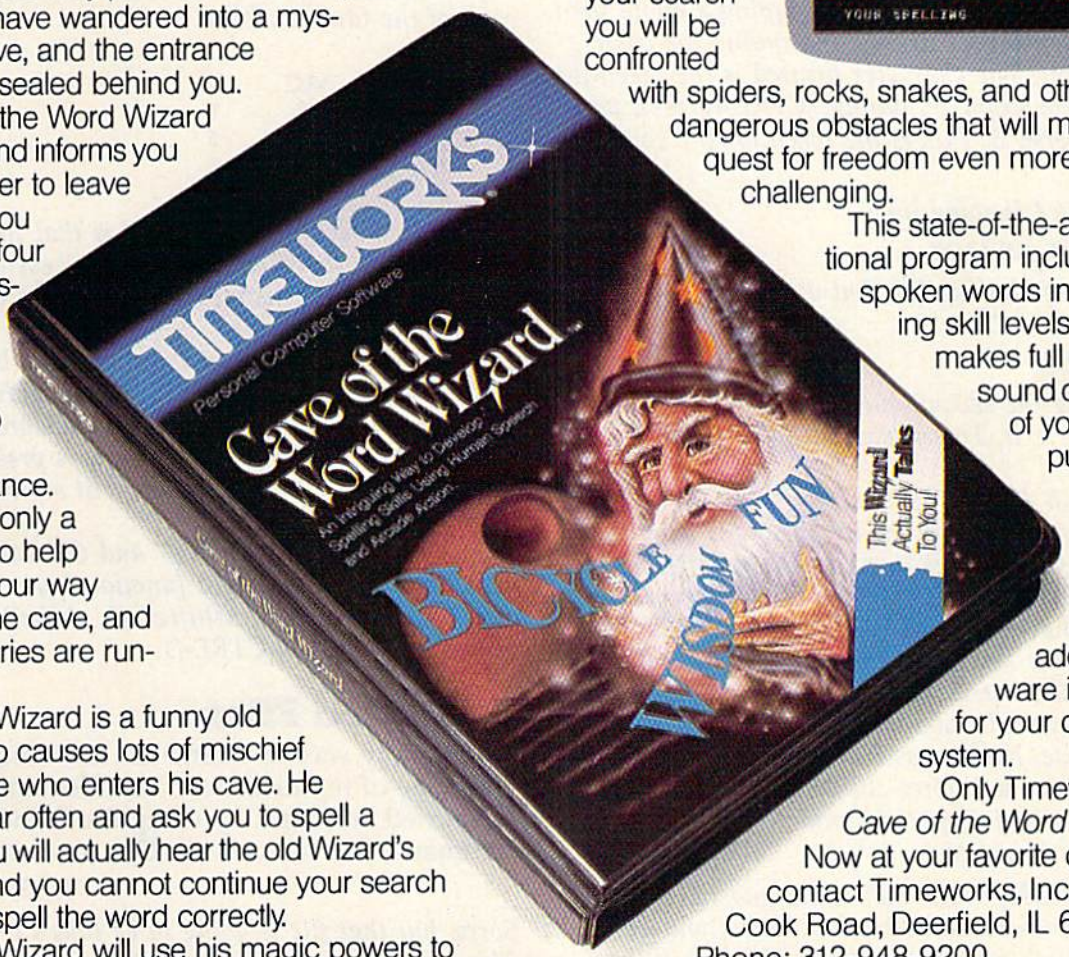

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can be done a number of ways. You can use a cotton swab lightly moistened with a mild solvent such as alcohol. But be sure to use a solvent that won't damage the plastic.

You could also use a pencil eraser. Lightly rub the eraser across the metal contacts, then brush and blow any residual particles away before using the cartridge.

Colorful LISTings

I have a commercial game written in BASIC which LISTs parts of the program in various colors. How is this done?

Lyle H. Shaw

Producing colorful listings is done with a REM statement followed by a quotation mark and color tokens. To see this in action, follow these steps:

1. Find out which token represents the color you want in your listing. Do this by typing a quote then holding down the CTRL key and typing the color key you want. The character printed is the token for the color. For example, typing "CTRL-WHITE will print a reverse E. This is the token for the color white.

2. Enter the following line:

```
10 PRINT "HELLO"
```

3. Type the following line but do not press RETURN:

```
20 REM ""
```

After typing the second quote, press the DEL key once to delete it. This makes sure you're not in quote mode.

Now hold down CTRL and press the RVS ON key (since you're not in quote mode, you should not see a reversed R). This turns on the reverse character mode. Press SHIFT/M. The reverse graphics character that is printed is the token for RETURN. Now press the key to get the token for the color you want. If you wanted the listing color to change to white, for example, you would press E while in the reverse mode. Now press RETURN to enter the line. This REM line will force the color change when the program is listed. Type and enter:

```
30 PRINT"HELLO"
```

Press RUN/STOP–RESTORE and LIST the program. Lines 10 and 20, when listed, will be blue. Line 30, which is after the color change, will be white. (VIC users have to change the screen color from white to see line 30.) Any of the 16 colors (8 if you have a VIC) can be used.

This technique can also serve as a form of program protection. If you change the character color to match the background color, the program will appear to be LIST proof. And this technique is not limited to color changes; you can insert tokens for cursor movements, delete characters, or even clear the screen (using a reversed heart) when a user tries to list the program.

PEEKing Function Keys

I have a 64 and have read many articles on how to program the function keys. Most of these use the GET statement. Is there another way to detect when a function key is pressed? Is there a location I can PEEK?

Steve Stepleman

Yes, memory location 197 in both the VIC and 64 indicates the current key pressed. Enter and RUN this one-line program:

```
10 PRINT PEEK(197):GOTO 10
```

While the program is running, press the function keys. As you can see, each time a key is pressed, the value in memory location 197 changes. When no key is pressed, the value is 64. Here are the values for each of the function keys:

KEY PRESSED	VIC	64
f1	39	4
f3	47	5
f5	55	6
f7	63	3

A drawback to this method is that the values displayed are the same whether the keys are SHIFTed or not. This means you receive values for only four function keys.

However, this can be circumvented by PEEKing another memory location, 653, which indicates whether the SHIFT, CTRL, or Commodore keys have been pressed. When the SHIFT key is pressed, bit 0 will be on, the Commodore key will set bit 1, and the CTRL key bit 2.

A PEEK at locations 197 and 653 can give you more than the usual eight function keys. You can distinguish between unshifted-f1, shifted-f1, Commodore-f1, and CTRL-f1.

Unwanted Files

Is there any way to scratch an unwanted file from one of my diskettes? The filename is ",". I have tried erasing it by using the SCRATCH command, but to no avail. Can you help?

Andrew Hansen

Sorry, but that file is going to be tough to get rid of. The computer processes a comma as a delimiter—a character used to separate two parts of a command. For example, when you want to read a sequential disk file, you have to open it first: OPEN 2,8,2, "filename,S,R" (note how the commas separate the filename from the S for Sequential and R for Read). As the disk drive sees it, the commas are not characters in the filename. They perform a special function. Your disk drive sees your file "," as

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TIME TO FORMAT	17 seconds. (Compare to 1 min/20 sec. with 1541).
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PARALLEL BUS	YES, for enhanced speed, IEEE for Commodore compatibility.
DAISYCHAIN	Up to 4 drives
OPERATIONAL SUPPORT	• Power-on diagnostics to ensure proper disk drive operation. • LED status lights display where error is occurring. • Easy to understand instruction manual.
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STORAGE*

Total Capacity	174848 bytes per diskette
Sequential	168656 bytes per diskette
Relative	167132 bytes per diskette 65535 records per file
Directory Entries	144 per diskette
Blocks	683 total per diskette 664 available per diskette
Tracks	35 per diskette
Sectors	17 to 21 per track
Bytes	256 per sector
Diskettes	Standard 5¼", single sided single density

*NOTE: The SD-2 contains two disk drive mechanisms and can therefore handle two times the above capacities (one for each diskette).

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Commodore Compatible Serial Bus Interface
Commodore Compatible IEEE Parallel Bus Interface

PHYSICAL DIMENSIONS

	SD-1	SD-2
Height	6.2" (157 mm)	6.2" (157 mm)
Width	4.2" (107 mm)	5.9" (150 mm)
Depth	13.3" (338 mm)	13.3" (338 mm)

INTERFACE

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Commodore compatible IEEE Parallel Bus
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Power	50 Watts

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"[delimiter/end of filename]". This renders the SCRATCH and RENAME commands useless.

In general, when you're naming a disk file, stick to letters and numbers. Avoid punctuation marks like commas, colons, and asterisks (although certain characters—periods, slashes, and dashes—are OK). One particularly troublesome character is the SHIFT-SPACE, which is used by disk drives to pad out names of less than 16 characters and marks the end of the filename.

However, there is a solution to your problem. If you have a disk editor (a program that can change a byte directly on the diskette), you can change the "," on the directory to, say, an "a", then scratch the program using the new filename.

The other alternative is to copy any files or programs you wish to save to another diskette, then simply reformat the diskette with the bad file.

INPUTing The TI$

Is there a way to set the TI$ variable with the use of an INPUT command within a program?

Chris McDonough

Yes, and it's easily done. Use this BASIC line in your program:

```
10 INPUT TI$
```

When the program runs and the INPUT prompt is displayed, enter your response in this format: HHMMSS, where HH=hours, MM=minutes, and SS=seconds. For example, inputting "123456" will set TI$ to read 12:34:56. If you try to enter a time with more than 23 hours, 59 minutes, or 59 seconds, your computer will figure out what the time should have been. Input "123499" and the 99 seconds will be changed to 1 minute 39 seconds, resulting in 12:35:39.

Non-Relocatable Tape Loads

When using tape, why do you have to *LOAD "filename",1,1* when just typing *LOAD "filename"* will work just as well?

Ian Ball

Although both commands will successfully load a program into memory, they are significantly different. LOAD "filename" will load a program into memory at the start of BASIC wherever the start of BASIC may be. It is called a relocatable LOAD.

LOAD "filename",1,1 is a non-relocatable tape load, sometimes called an absolute load (the equivalent disk command is LOAD "filename",8,1). This means that the program will load itself into memory at the same address from where it was saved. This is used mainly for machine language programs that must load somewhere other than the start of BASIC.

For example, in the Commodore 64 you can place machine language programs in a 4K block of memory starting at address 49152. If you loaded this program with the LOAD "filename" format, it would load into memory at 2049, the start of BASIC.

ML SAVEs With BASIC?

I have a few machine language subroutines I would like to save as a BASIC program with the BASIC line: 10 SYS 2061. I have tried saving it with Supermon using:

```
.S "filename",08,0800,0900
```

But when I load this program back in, it looks like a mess. Can you explain why?

Also, could you list the Commodore 64 BASIC ROM routines ($A000-$BFFF) and all of the Kernal routines ($E000-$FFFF)?

Leonard Spasiano Jr.

Your machine language program looks funny (and probably won't run) because you have it shifted down in memory by one byte.

Although the start of BASIC in the 64 is listed as address 2048, programs are actually loaded into memory starting at location 2049. Byte 2048 is always a 0, and signals the start of BASIC.

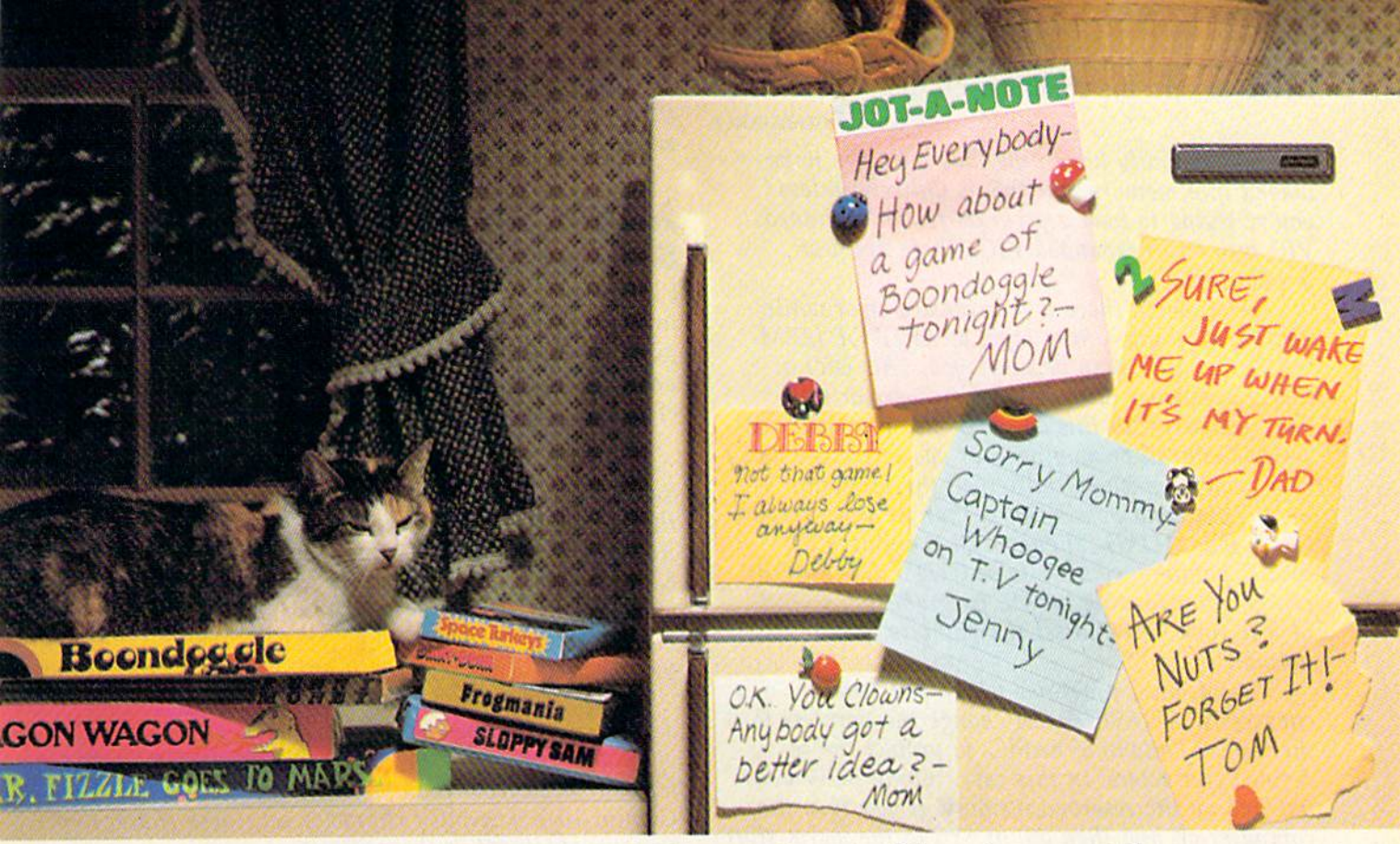
If you want your programs to load correctly using the LOAD "filename",8 (disk) or LOAD "filename" (tape) format, start your SAVEs at address $0801, not $0800 ($1001 on an unexpanded VIC, or $1201 for a VIC with 8K or more expansion memory). When using this method on a 64, the first twelve bytes should be (in decimal) 11, 8, 10, 0, 158, 50, 48, 54, 49, 0, 0, 0 (the equivalent of SYS 2061, the beginning of your ML program). The first two bytes are the line link, the next two the line number (10). 158 is the BASIC token for SYS, followed by four ASCII numbers that spell out 2061. The three zeros are crucial because they mark the end of the short BASIC program. When you use a relocatable LOAD (see above), BASIC automatically relinks all the lines until it reaches the end of the program. If you omit the zeros, your ML routines will be treated as program lines, with potentially disastrous results.

The advantage to this method (used in "SpeedScript," "Campaign Manager," and "Screen-80") is that the user does not have to remember the SYS number—it is built into the program. You simply load the program and type RUN.

BASIC and Kernal ROMs are each 8K for a total of 16,000 bytes—much too lengthy to be listed here. However, for a good explanation of both the VIC and 64 ROMs, try Mapping The VIC *or* Mapping The 64, *both published by COMPUTE! Publications.*

Out Of Memory Errors

When loading a program from disk or tape, I occasionally get an OUT OF MEMORY error. This happens even when I type NEW before the


JOT-A-NOTE
Hey Everybody- How about a game of Boondoggle tonight?- MOM
SURE, JUST WAKE ME UP WHEN IT'S MY TURN. -DAD
DEBBY Not that game! I always lose anyway- Debby
Sorry Mommy Captain Whoogee on T.V tonight- Jenny
ARE YOU NUTS? FORGET IT! TOM
O.K. You Clowns- Anybody got a better idea?- Mom
Boondoggle
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LOAD or turn the computer off then on.

Lyle Shoemaker

You may actually have programs too large to be loaded into memory, but this is unlikely unless you're trying to load a program for an expanded VIC into an unexpanded VIC. There are four possibilities.

First, when there is a hardware error while loading a program from tape, an OUT OF MEMORY error will often be displayed. This isn't actually a memory error, but a hardware or tape (cassette) error. In this case, try cleaning your cassette tape head or moving your cassette drive away from your television, and reload the program.

The second possibility is that on a 64, an absolute load (LOAD "filename",8,1) changes the BASIC pointers, causing false OUT OF MEMORY errors. After loading an ML program, it's a good idea to type NEW, to set the pointers back to normal.

Third, most programs which put custom characters in BASIC RAM change the pointers to the top (or bottom) of BASIC, to protect the redefined characters. In this case, typing NEW does not free up the reserved memory. If you turn the computer off and then on, or SYS to the warm start vector (64738 on a 64, 64802 on a VIC), the memory will be available for loading other programs.

*Finally, some cartridges (*Simons' BASIC *is one) use part of BASIC memory, which may cause problems when loading very long programs. If this is the case, your only option is to unplug the interfering cartridge.*

Modem Interrupts

Here's a tip for all you modem users. When using a modem, outside sound must not invade the phone line during transmissions. If sound intrudes, the modem can "hang-up" and data might be lost.

Unfortunately, the *Call Waiting* option available in some areas causes just this problem. The tone which signals that a call is waiting causes the terminal program to crash. However, there is a way around this. To prevent the crashes, you can use *Call Forwarding*, which turns off the tone produced by call waiting.

One drawback is that people who are calling you will not get a busy signal. If you forward your calls to an automated service such as *Time of Day*, at least callers will know your phone is tied up.

D. Martin

Thanks for the tip. It's a good idea. However, we don't advocate using an automated public service like Time of Day. *Perhaps users could forward calls to a phone they know won't be tied up, such as the office or school during nonbusiness hours. Also consider that some phones are equipped with answering machines or tie in to automatic answering services.*

A New *SpeedScript* Character Set From *Ultrafont+*?

I am a foreign language instructor, and have enjoyed using *SpeedScript* to print in foreign languages with my Gemini 10-X printer. Is there any way I can use *Ultrafont+* to create a new character set for *SpeedScript*?

Amir Findling

Yes and no. The VIC versions of SpeedScript *and the original 64 version published in January use the ROM character set, which is inaccessible. But the May* GAZETTE DISK *version for the 64 uses a custom character set (beginning at hexadecimal $2000, decimal 8192) which can be changed to fit your preference.*

If you have the 64 disk version, you can create a new SpeedScript *character set without too much effort. First you need to know what changes to make for your needs. For example, once you access the Gemini 10-X's Spanish character set, these characters are redefined in the printout:*

[from the keyboard becomes inverted exclamation point,

] from the keyboard becomes inverted question mark, and

£ from the keyboard becomes capital N with tilde.

Consult your Gemini manual to see how the characters are defined for other languages. The character code for the English pound sign (£) on the Commodore keyboard is 92. This means that the Gemini will print whatever character is currently ASCII 92 for the activated character set. In the Spanish set, that is the capital N with tilde. In the French set, it is the lower case C with cedilla. In the USA set, it is a backslash.

For Spanish, then, you would want to draw the capital N with tilde in the character block that contains the English pound sign. After you have used Ultrafont+ *to create the character set you want, use the S command of* Ultrafont+ *to save the new character set. The next step is tricky. After the set is saved, turn the computer off and on, then type:*

```
POKE44,32:POKE32*256,0
```

followed by RETURN. Now LOAD the new character set you created with Ultrafont+*:*

```
LOAD"CHRSETNAME",8
```

Now, to create a relocated character set,

```
SAVE"NEWSETNAME",8
```

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This will make the set with a new loading address compatible with SpeedScript. *Turn the computer off and on, LOAD but don't RUN* SpeedScript, *and*

```
LOAD"NEWSETNAME",8,1
```

Create the new version of SpeedScript *with the following (use any name you like):*

```
SAVE"NEWSPEEDSCRIPT",8
```

Refer to the discussion in the "SpeedScript Customizer" article in last month's issue for more information on printing foreign languages. Some characters are not available from the keyboard. If you want a lowercase n *with tilde, for example, you have to redefine a reverse video number in* SpeedScript, *like this:[6]=124 ([6] is obtained by pressing CTRL-£ then a 6). In this case you want to redefine the reverse video 6 character as an* N *with tilde using* Ultrafont+. *This way pressing CTRL-£ 6 prints the correct character on the screen.*
Don't forget that you still must access the foreign character set before the Gemini will print what you want. You could set up a Cyrillic, Greek, or Hebrew alphabet for SpeedScript *with* Ultrafont+, *but it would only be good for "video notes," since the printout would still use English letters.*

Diskette Dangers

I am going to be traveling overseas and I'll be taking my software (on diskette) along with me. What precautions should I take to protect the diskettes against the likes of x-ray machines, airplane altitude, etc?

Tim Farrell

We contacted a representative of a diskette manufacturing company who stated that x-ray machines pose no real dangers to floppy diskettes.

However, there are precautions to be taken. Watch out for magnetic fields. Don't pack those diskettes in such a way that they will be exposed to electric motors, magnets, etc. Also, be aware of temperatures. Most manufacturers recommend that floppy diskettes not be exposed to temperatures below 50 degrees or above 125 degrees Fahrenheit (10 to 52 degrees centigrade). Because the cargo holds of airplanes could exceed these limits, it might be advisable to pack your diskettes with your carry-on luggage.

The most obvious danger is the possibility of physical damage while handling. Pack the floppies so that they will not be subjected to bending or crushing loads.

Pack them in a dust free container (plastic zip-lock bags, for example) if possible. According to the representative, far more disks are lost to dust contamination than to magnetic fields.

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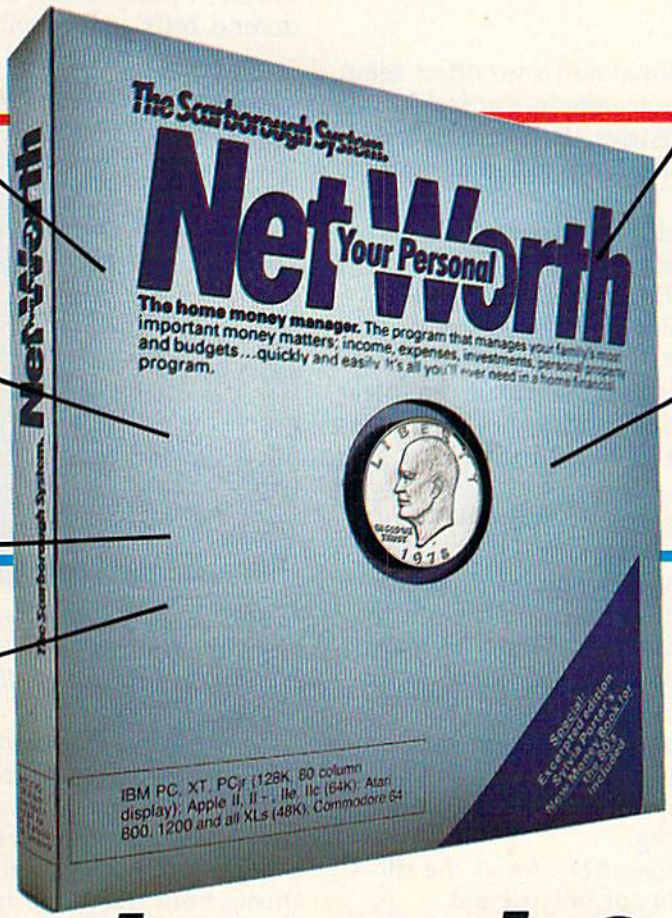
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New Approaches In Educational Software

Selby Bateman, Features Editor
Sharon Darling, Research Assistant

Construction sets, simulation programs, and other software innovations are bringing a new sense of interactivity and excitement to computer-based education. For Commodore owners, there's a new land of opportunity in learning software.

Trends in educational software often seem as volatile as the trends in the fashion or automotive industries. The field is certainly every bit as competitive and as potentially lucrative.

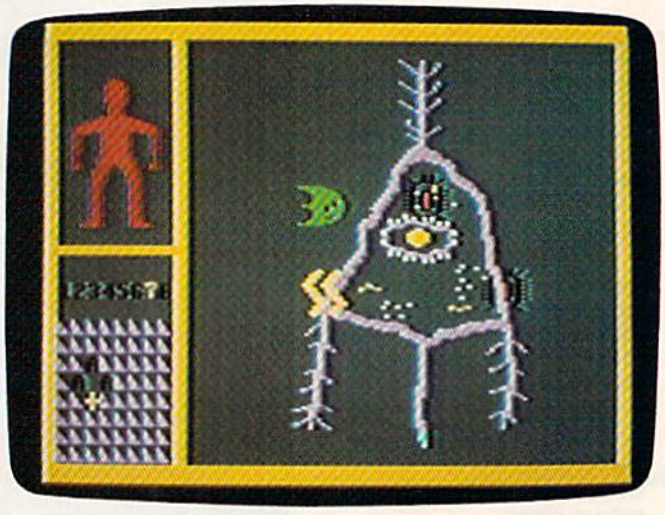
Hundreds of competing companies are exploring ways to take advantage of the educational software market. Educators debate the merits of a dozen different approaches to computer-based learning. And while everyone agrees there's room for improvement, some of the latest packages are showing the skeptics that the computer can be a stimulating, educationally valid learning tool.

That's very important, says Spinnaker Software Chairman William Bowman, whose company has been designing educational programs since 1980. "Children oftentimes don't want to learn the way you or I may want them to learn. Some kids learn visually, other kids learn in an auditory way, some learn tactilely.

"Good software should provide for as many of these different ways to learn as possible by providing the child an opportunity to choose multiple paths for learning."

Computer simulations offer one of the most fruitful means for this sort of heightened interactivity. Giving a computer user the ability to carry out everything from the dissection of a frog to the building of a space station, these simulated environments are thought provoking and, thus, highly educational.

Cell Defense, produced by ChildWare for Human Engineered Software (HES), for example, is an interactive human biology program which simulates the way the body defends itself. Children as young as ten years can take control of different parts of the body's immune system and defend cells against viral attacks.

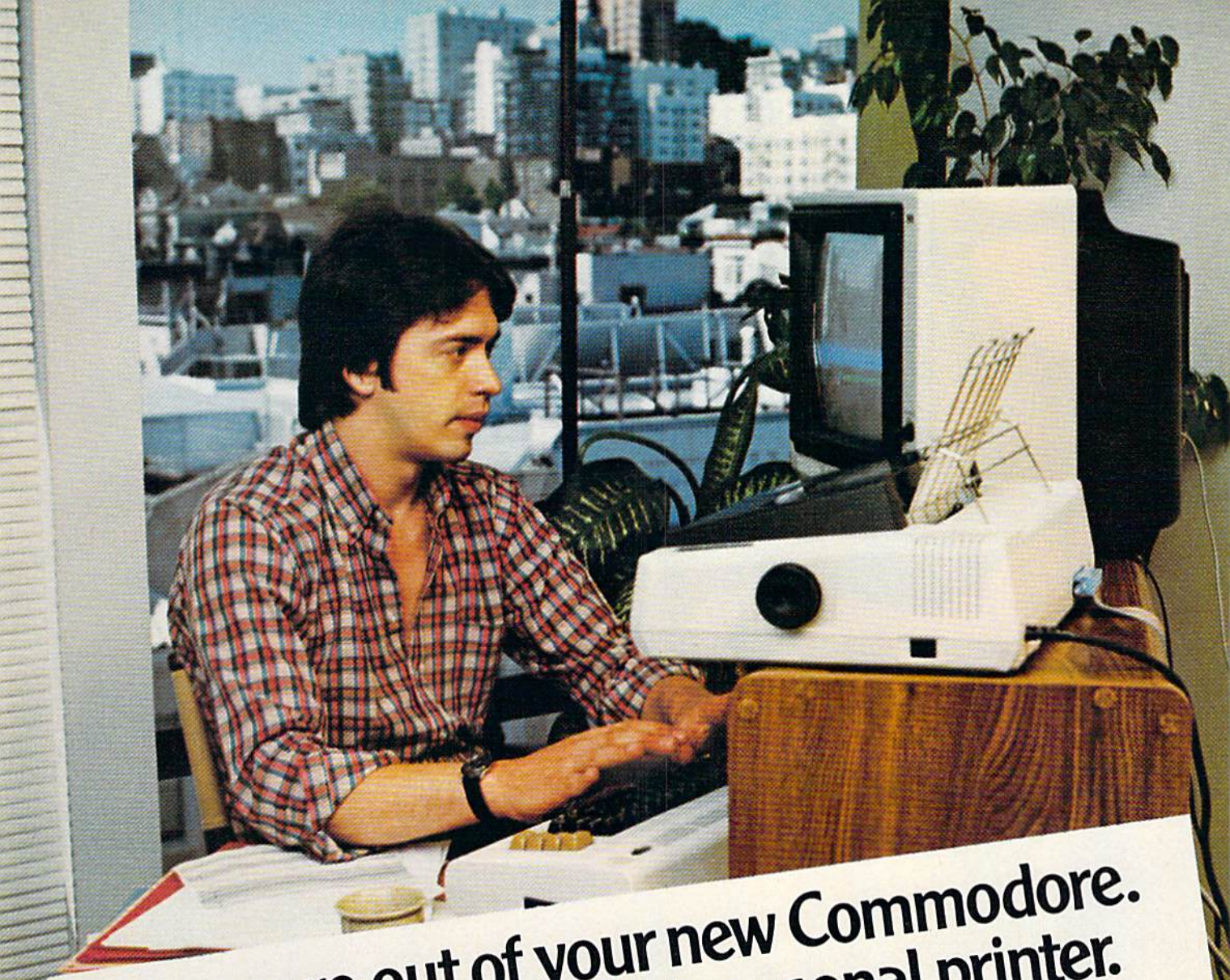


In HES's Cell Defense, *players learn about the body's biological defenses through a simulation game in which invading viruses are repelled from a variety of cells.*

The game has multiple levels and offers a brief, if simplified, introduction to human physiological mechanisms. Skin, inner tissue, and nerve cells must be defended. Interferon, macrophages, antibodies, and B- and T-cells are used throughout the game to fight the viral attacks.

Youngsters learn how aging, stress, drugs, and alcohol affect the body as the players scan and then defend various layers of cells.

"While other biological software programs



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"My Commodore* computer really helps with my marketing business. It does just about everything but type and lick envelopes. Which would be nice for all my direct mail.

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"I've used it for typesetting ads and even printing letters. The type is the most solid dot matrix I've ever seen.

"And it's great having both Commodore and Gemini graphics to play with. I've even designed my own logo.

"Buying the Gemini-10X was a good move. It made my Commodore a better computer."

Steven Clarke—San Francisco, California

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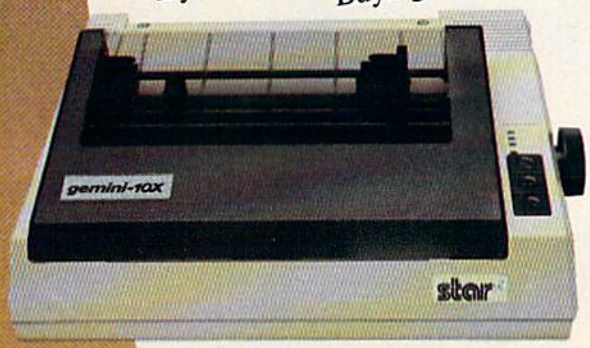

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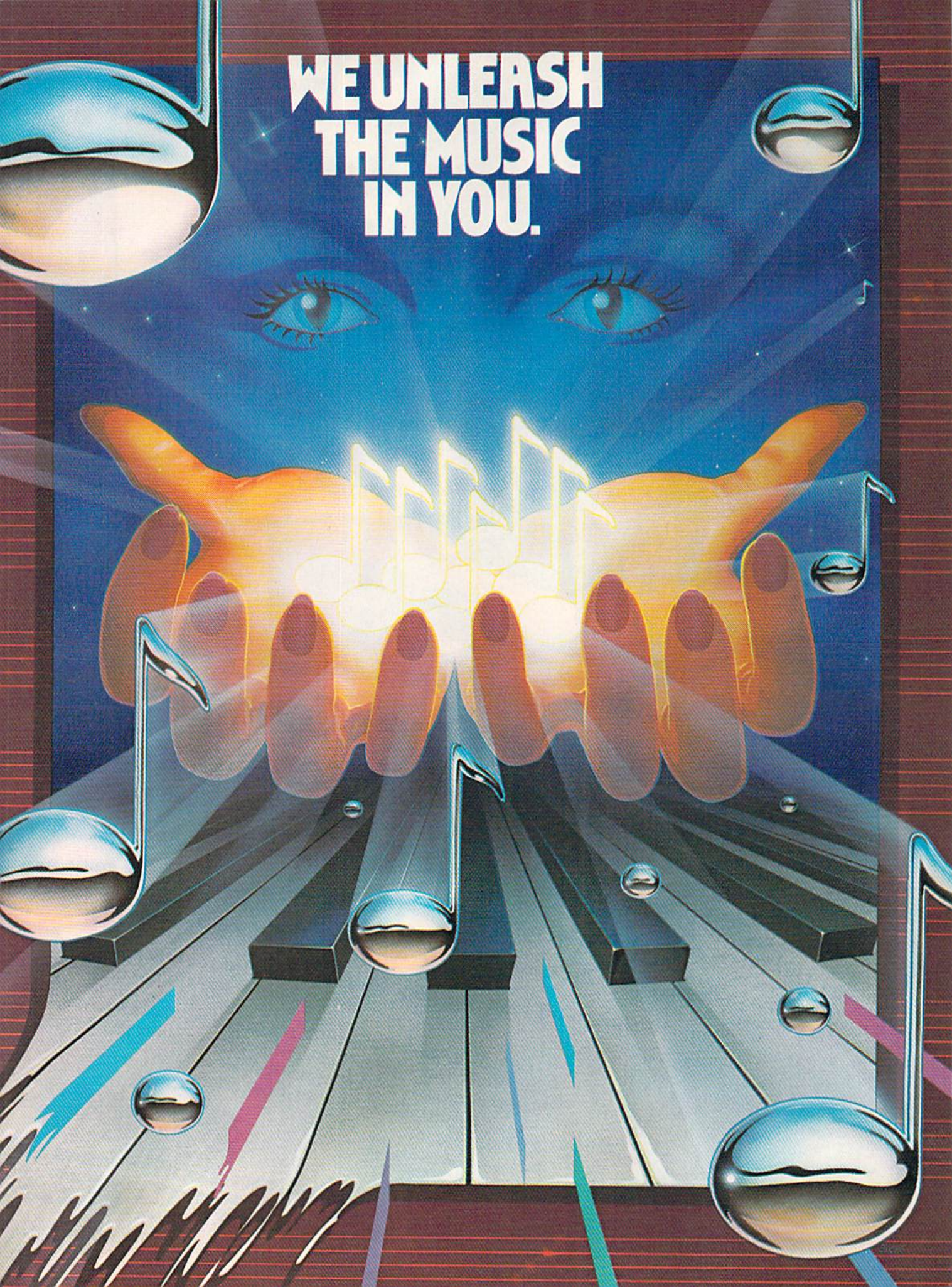
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are drill-and-practice-based, this is the first biology package that actually simulates the spread of a virus through the human body," says Dr. Sueann Ambron, director of educational software at HES. "With *Cell Defense*, children have to make their own decisions and draw conclusions from available data to successfully ward off the spread of disease."

Cell Defense is only one program in a new science simulation series from HES (all available for Commodore 64 on disk). Among the new titles is *Life Force*, in which students learn the basic cell processes by simulating the splitting of DNA and producing complete, animated organisms.

Other programs in the series include *Reflections*, which teaches the physics of light reflection, refraction, and absorption with mirrors and light beams; *Ocean Quest*, in which players search the world's oceans while aboard simulated research submarines; and *Project: Space Station*, which lets a player simulate the design and production of an orbiting, manned space station.

Project: Space Station is a simulation, but it is also a *construction set*, or *builder*. This type of software represents yet another trend in computer education and offers one of the most interactive learning environments.

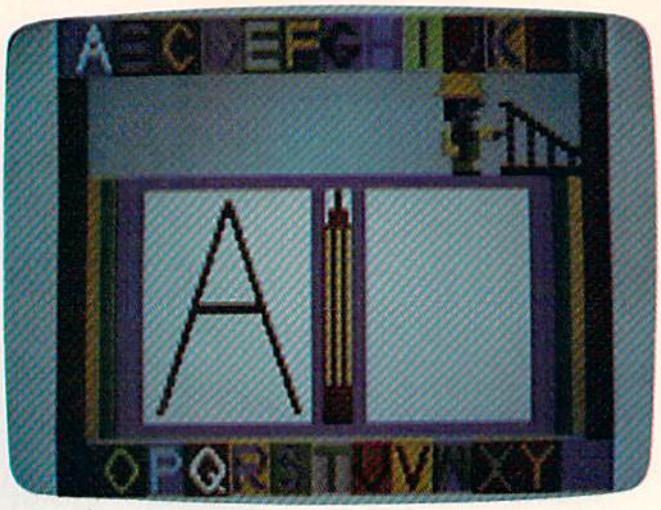
Builders are being used in a variety of ways, and for all ages, as educational tools.

HES's space station simulation/construction set, for instance, is based on designs provided by NASA. It includes such real-life constraints as budgeting problems, unfavorable media coverage, and bad weather. Players create a budget, schedule a launch date and place, choose equipment, modify and add parts, determine the focus of the mission, select a crew, and maneuver construction parts with a shuttle's remote manipulator arm or with rocket pods.

Other construction sets, all of which received their creative impetus from Bill Budge's *Pinball Construction Set* (Electronic Arts), are becoming easier to find.

Alphabet Construction Set, from Futurehouse's Playground Software Series, uses Robo the Alphabet Builder to help young children learn the alphabet. Youngsters not only hear a voice, which is generated by the program, say the letters and offer instructions, but also they construct the letters on the screen using the company's Edumate Light Pen. The program also analyzes the letters that the child draws, pointing out mistakes and suggesting corrections.

One of the most successful builders [previously available for Apple computers and now converted for the Commodore 64], is *Rocky's Boots*, an electronic erector set in which players

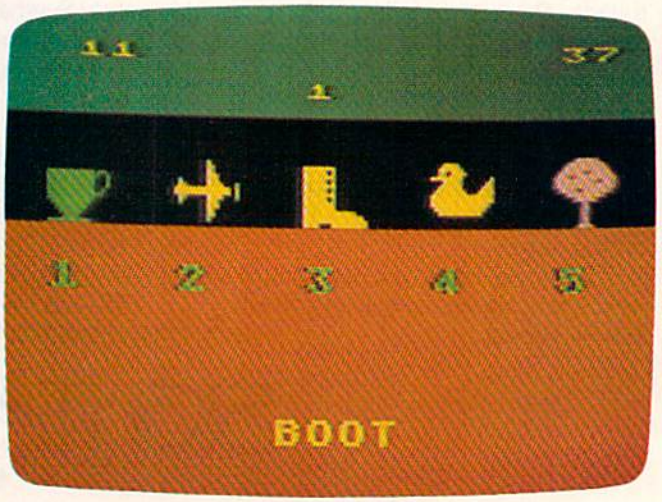


Alphabet Construction Set *(Futurehouse) offers youngsters a chance to see, hear, and actually form letters of the alphabet.*

ages nine and above learn the basics of building computers by playing any of 40 different games using simulated computer logic circuits.

Still another builder is used in Mindscape's *Tonk In The Land Of Buddy-Bots*, five multilevel games in one package for children from four to eight years. Players help Tonk, an electronic character, find the missing parts of a Buddy-Bot robot by performing well in different learning games. (See *Computing For Families* elsewhere in this issue.)

Building creativity, fun, and interaction into educational software is crucial to the success of a program, says software developer Frieda Lekkerkerker, author of the popular typing program, *Kids On Keys* (Spinnaker Software), and of *Linking Logic*, *Memory Manor*, and *Logic Levels* (all from Spinnaker's Fisher-Price Learning Software).



Kids On Keys *(Spinnaker), a popular typing program for young children, created by Frieda Lekkerkerker.*

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Her programs are not as curriculum-oriented, but rather "they involve more thinking, more logic concepts—they let kids make plans ahead of time," she says.

In *Linking Logic*, for children from four to eight years old, the player must plan a path through a building so that he or she picks up the greatest number of matching tiles missing from the bottom floor of the building.

This learning game, like her others, is an attempt "to make the software transparent, to give children the feeling they are in control," she says.

Lekkerkerker, a teacher who came to the U.S. from Holland, is currently working on several construction sets in which the concept of control is part of the overall game play. What she hopes to impart to these builders is a similar sense of interaction which children receive from non-computerized erector sets—Lincoln Logs and the like.

"Basically, my games are pragmatic. They come more out of watching kids play games," she says. "The frustration level, I feel, is very low [in her games]."

Lekkerkerker once completely redesigned one of her programs after observing children playing with it. "With the original concept of the game, children would have been penalized points for the method they devised, so I modified it," she says.

Flexibility and long-term interest are components of the best educational software, says Lekkerkerker. "A game, or any kind of product, should be very easy to understand at first. But it should be able to be expanded on in ways the creator doesn't even know," she adds.

Just Imagine *(Commodore) is a new interactive educational program which lets youngsters write their own animated stories.*

User-software interaction is a feature of several new educational software products from Commodore as well.

Just Imagine, for children from 4 to 14 years old, lets youngsters create their own animated stories. A variety of different background screens—a jungle, a farm, outer space, and other scenes—combine with animated objects and written stories to build a filmlike sequence. The child types the story, and the program provides graphics, music, and special effects. Up to three characters can be chosen to move around the scene as the story's plot is developed by the child.

"That's probably our latest and greatest as far as language arts is concerned," says a spokesperson for Commodore's educational software division. "A program shouldn't try to fit a child into one particular way of thinking. It should let them think divergently, and expand on what they know."

Another program from Commodore, *Number Builder*, for children from 8 to 13 years old, uses an arcade-style format with varying levels of difficulty to teach children mathematical operations. There is a self-testing mode in the game as well.

A similar concept is used in another Commodore mathematics program, *Fish-Metic* (for ages 7–13), in which children play a game to learn the concepts of greater than, less than, and equal to. Those concepts are then applied to positive and negative whole numbers, fractions, and decimals.

One of the newest programs from Commodore is *Sky Travel*, a home planetarium program which presents sky maps from ten thousand years in the past to ten thousand years in the future as users learn facts about astronomy. The maps can show the sky from anywhere on earth.

Players simulate flying a plane across a map of the world as the program automatically determines longitude and latitude.

"What we like to do with educational software is encourage the thinking process and the questioning that goes along with learning," says the Commodore spokesperson.

While no single article can mention the many new educational programs taking advantage of some of the newest computer-based learning concepts, even a cursory look at the field indicates that many programs are targeted at the Commodore 64.

The 64's graphics and sound capabilities are too good for programmers and software companies to ignore, according to Spinnaker's William Bowman.

"Our software engineers and our software developers will spend an enormous amount of

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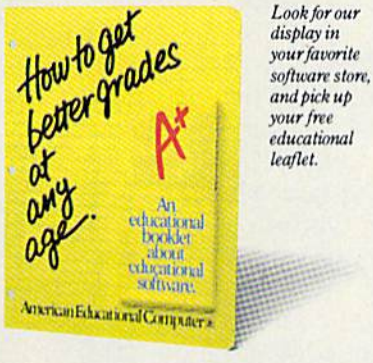
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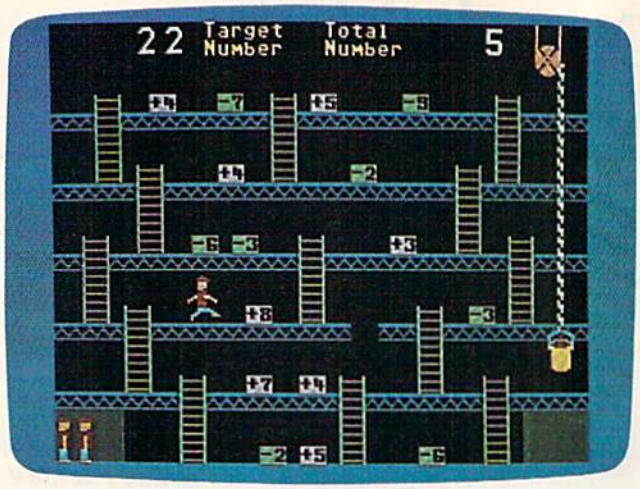

Number Builder *and* Fish-Metic *(both from Commodore) use colorful arcade-style screens and action to help children learn mathematical concepts.*

time working on challenging the sound chip [in the 64], or pushing the sprite graphics just as far as they possibly can be pushed," he says.

And the results for Spinnaker's 64 software, he believes, are educational programs which are "very visually deep, and have a musical dimension and game play that takes advantage of the machine, are consistent with the learning objective, and, very importantly, engage the child for a long period of time."

Putting these characteristics into educational programs is a challenge many software companies are eager to face. And with the huge installed base of 64s in the home and in schools, almost all of these companies are aiming their efforts squarely at Commodore owners.

Cross-Pollination: The Home-School Migration

There's a two-way migration going on among producers of educational software.

While some companies are broadening their school-based software lines into the home, those program developers who have concentrated on the home market are now promoting their products in school systems as well.

There are now two complementary markets for software companies to engage. Those businesses that have strength both in the school and in the home will survive, says Karen McGraw, software project editor for DLM Teaching Resources.

DLM, based in Allen, Texas, is an example of a company whose software was originally aimed at the school market, but which is now designing and selling educational software to the home market as well.

Much the same process is going on at Scholastic, Inc., long associated with schools, but now aggressively in the home educational computer market. And home sales for Scholastic are taking off, says President Richard Khaleel.

When American Educational Computer (AEC) began selling its line of educational computer software into homes, it related its programs almost totally to curriculum support by grade level and subject.

Says AEC President Thomas B. Garsh, "The subject is there; we know that. It's been tested and tried [in the schools]."

A good example of how a software company can promote its own products while at the same time offering a genuinely helpful service to schools interested in microcomputers is demonstrated by Scarborough Systems, Inc.

The company has begun a software donation program to schools. It runs from September 15 to December 15. When you purchase a piece of educational software from Scarborough, you also get a coupon that lets you donate a program of your choice to a designated school and teacher.

As microcomputers grow more prevalent in the home and in schools, educational software companies will continue to have two markets in which to compete. The result of this cross-pollination between home and school may ultimately mean higher quality and more diversity among computer-based learning products.

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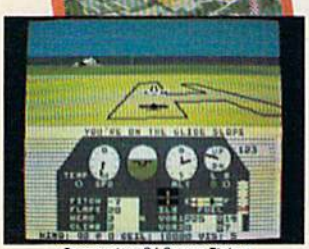

Commodore 64 Screen Picture

Major Bill has over 3000 hours of flying. He loves the sophistication of the SOLO FLIGHT simulation and its real life challenges of deteriorating weather, failing instruments, and overheating engines!! He knows the reality of flight — with SOLO FLIGHT he can bring it home!!

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SOLO FLIGHT is available for Commodore-64, APPLE, IBM, and ATARI computers. Suggested retail price is only $34.95. Find SOLO FLIGHT at your local retailer, or call or write for MC/VISA, Money Order, or COD orders. Add $2.50 for postage and handling (Int'l, add $4.00 USD). MD residents add 5% sales tax.

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Tom Snyder: Educational Software Developer

Kathy Yakal, Editorial Assistant

Software developer Tom Snyder

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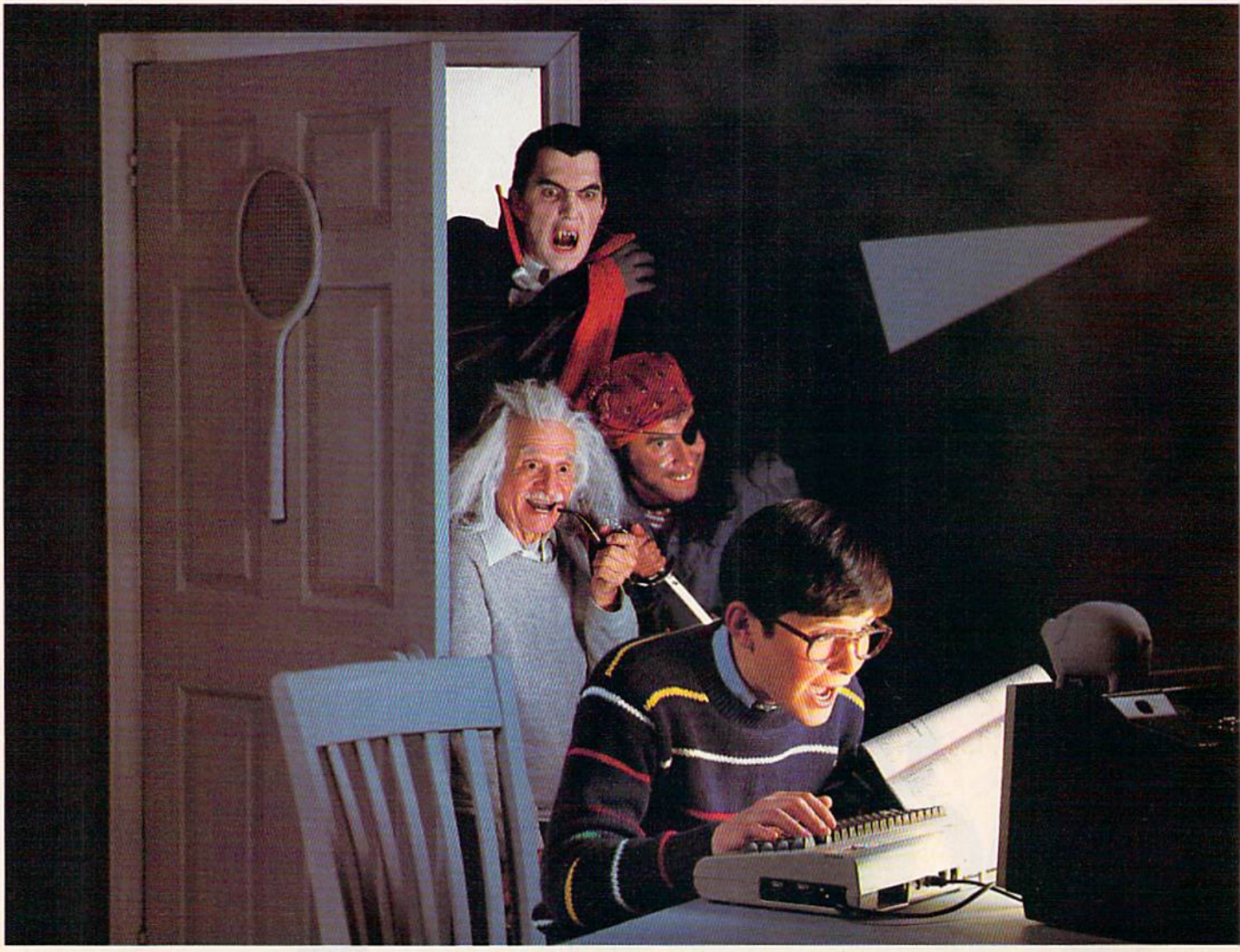

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COMMODORE 64: GETTING THE MOST FROM IT
Tim Onosko

Written for users with little or no previous programming experience, this handy guide is the only source with information on all three versions of the Commodore 64. It includes material on both the classroom model and the portable version. It offers a thorough and understandable introduction to the computer—including a solid approach to BASIC programming. It covers word processing, color graphics, and sound.

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BRAIN GAMES FOR KIDS AND ADULTS USING THE COMMODORE 64
John Stephenson

Between the front and back covers, this volume contains more than 40 exciting and challenging games. Designed to entertain and educate the reader, it teaches programming and the application of some very important mathematical concepts, without the pain. The games are short and precise and are targeted toward whose who learn best by doing. They can be played and enjoyed without an understanding of the mathematics involved. This is one volume you'll want to have for fun—for kids of all ages!

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BRAIN GAMES FOR KIDS AND ADULTS USING THE VIC 20
John Stephenson

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For the beginner, here is the book to buy with your Commodore 64. It is simply organized by BASIC programming statements so while programming, the user can go directly to the information he needs without confusion or delay. This one-of-a-kind guide contains the same information as the BASIC reference manual supplied with your Commodore, re-written especially for the new user. It presumes no knowledge of BASIC and explains the materials supplied in the manual.

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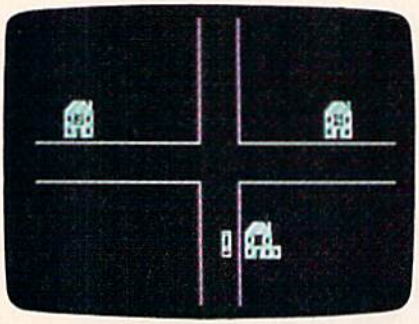

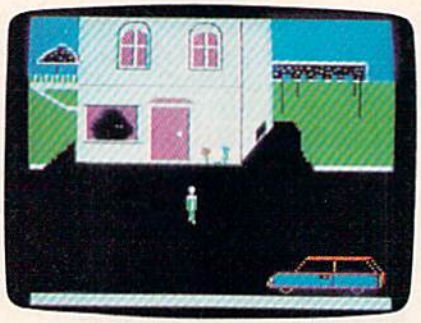

Hop in the Snoopmobile parked next to Snoop Headquarters...

...and drive around the streets of Costa Villa, questioning suspects at their homes and over the phone to find out who fishnapped Lily the dolphin from the Tabasco Aquarium. Snooper Troops *detective games help children learn to take notes, draw maps, classify and organize information, and develop vocabulary and reasoning skills. (All photos courtesy Larry Lawfer.)*

You can be a diver, or a detective, or a government agent. You'll travel on trains to different cities, on ships across the ocean, or in the "Snoopmobile," trying to find out who fishnapped Lily the dolphin.

Tom Snyder's educational software creates worlds for kids to play and learn in. His many programs are held in high regard by parents and educators for just that reason: Children are drawn to the software because it's fun, but they come away having learned new concepts.

And that's a difficult marriage. Educational software designers and publishers struggle constantly to find the right mix so kids like using the software, and parents and teachers are satisfied with its educational value.

"I'm a bit distinctive, probably, in that I was such a bad student."

Snyder's own education, as he describes it, was filled with frustration and self-doubt. Teachers told him, "Here, learn this set of facts. Write this paper. This is what you must know. This is what's important."

He asked them why. When they couldn't answer, he decided to learn what he thought was important, which didn't win him any points with teachers. "I was extremely active in projects, but I could not figure out how to do well in school," he says. "I began to think I was not a capable person."

He made films. He wrote songs. He played around with computers, and sent one of his designs to IBM.

Shortly afterward, he says, "I came home from school and found a couple thousand dollars worth of hardware parts on the lawn, with a note from IBM that said something to the effect of, 'That was a good idea you had. Mess around with this stuff and remember us when you design anything else.'"

"All it took for me to come into my own was getting a teaching job. Ever since that first day when I went in as a novice and saw 25 fifth graders looking at me, I've done exactly what I'm supposed to do."

In spite of the encouragement from IBM, Snyder's temporary fascination with computers faded for a while. After finishing high school ("definitely in the bottom half of my class"), he spent a few years playing keyboards in a rock and roll band, with a recording contract at Capitol Records.

He returned to school, studying French and music at Swarthmore College ("I was on probation most of the time"), then got a master's degree in education from Lesley College in Cambridge, Massachusetts.

His first day of work at Shady Hill School in Cambridge confirmed what he had believed as a student. "All I needed was a non-arbitrary responsibility," says Snyder. "If I didn't teach those kids, they were missing something. However, if I didn't write a paper on value-added tax for my economics professor who wouldn't read it anyway, nobody was worse for the wear except me, and I was already taking care of me."

"The group of people in the world which is least capable of learning for abstract reasons is the very group that is forced to learn for abstract reasons all of the time: kids."

"If you ask second-graders why they're studying math, it's surprising and depressing, but

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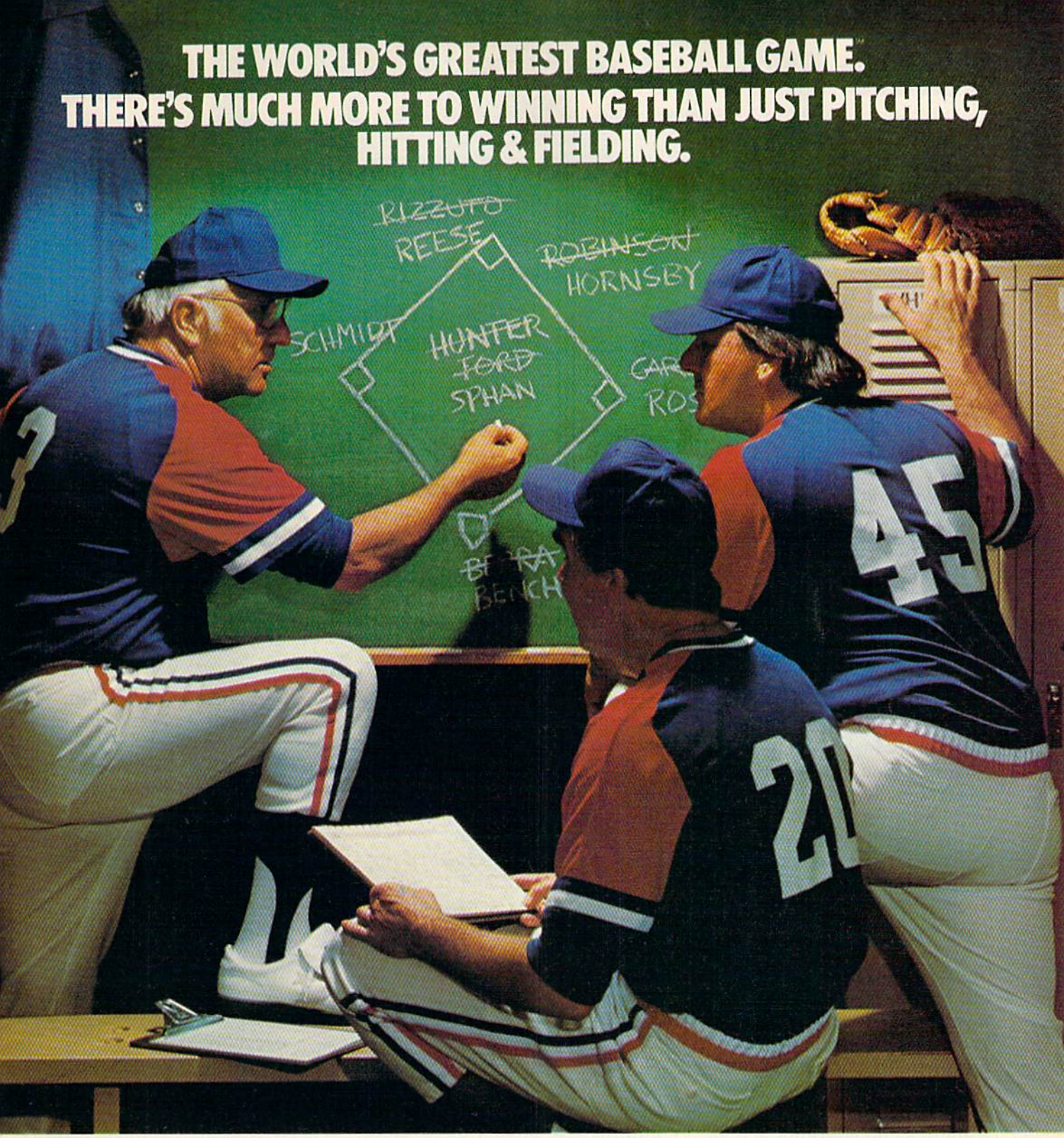

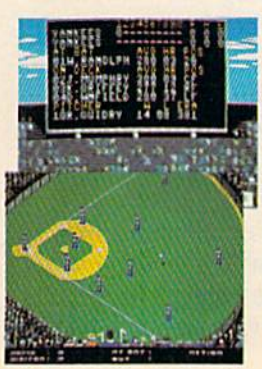

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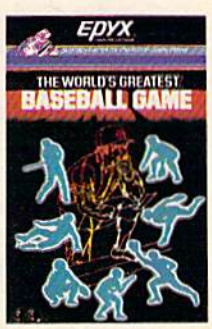
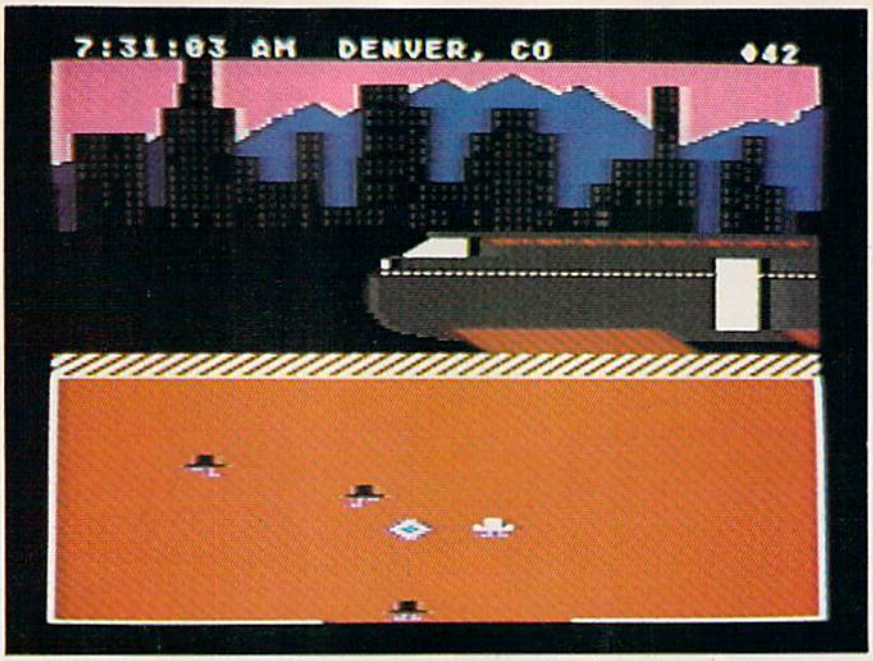


EPYX™ COMPUTER SOFTWARE

Strategy Games for the Action-Game Player



In Agent U.S.A., *it's up to you to save the nation from the dreaded FuzzBomb. On your way across the country by train, you must gather strength by growing crystals and keeping them away from the FuzzBodies. Make sure to read the schedule correctly at each stop, or you'll miss your train.* Agent U.S.A. *helps children learn to read maps, learn more about U.S. geography, and improve critical thinking and math skills.*

they'll actually say because it's good for them," says Snyder. Or because they have to or they're supposed to. "These are very arbitrary reasons.

"When I teach, I try to make sure the kids know exactly what they're doing, why they're learning. If I can't come up with a good reason, if I can't get the kids involved in the community or helping people or creating value in a real way, I create a game, which is the next best option to get them excited about what they're doing."

For Snyder's class of fifth-graders, these games were data-intensive simulations. If they were studying geography, they became the crew of a ship crossing the ocean. The kids loved it, but Snyder faced a real management problem just trying to keep track of all the needed information, using paper and pencil.

Though he had no notion of using it as an educational tool, Snyder had bought a Radio Shack computer in 1979, and was using it to organize notes, help write reports, and keep track of grades.

The management problem he was running into with his simulations sparked an idea. "It became obvious to me that I could use the computer to manage these simulations," he says. "The computer could keep track of where the kids were in the game, make random choices, and have an overview of what the world looked like."

"The next step was to turn the computer around and let the kids push the buttons. And as I dared to turn the computer around, I had to come up with easy ways for the kids to enter information and get information back."

By designing simulations in which the students were responsible for keeping track of the information, Snyder discovered an unexpected bonus. "I remember walking home the first few nights I did that and thinking, gee, maybe a computer could solve some of the problems my simulations have always had," he says.

One of those problems that disturbed him was how to get everyone in the group involved. "Having run the simulation without a micro, there were always certain people left behind or group dynamics problems," he says.

To combat that, he developed programs that divided the screen into several different areas, each of which contained information that was essential. "Suddenly you can sort of create an expertise in each child. Each child has a piece of information and no one bright student can get it all because it only lasts a few seconds on the screen."

Snyder watched children who had rarely spoken or been spoken to by classmates suddenly become an important part of the group. They were learning, they were having fun, and they were talking to each other.

"Teachers across the country say this software is important, this is a way to use the computer. Not one kid on one program, but having the computer actually promote group dynamics, which is just the opposite of what people thought the computer would do."

Buoyed by his breakthrough, Snyder hired a New York consultant for $500 a day (on a teacher's salary) to see if his discovery was as important

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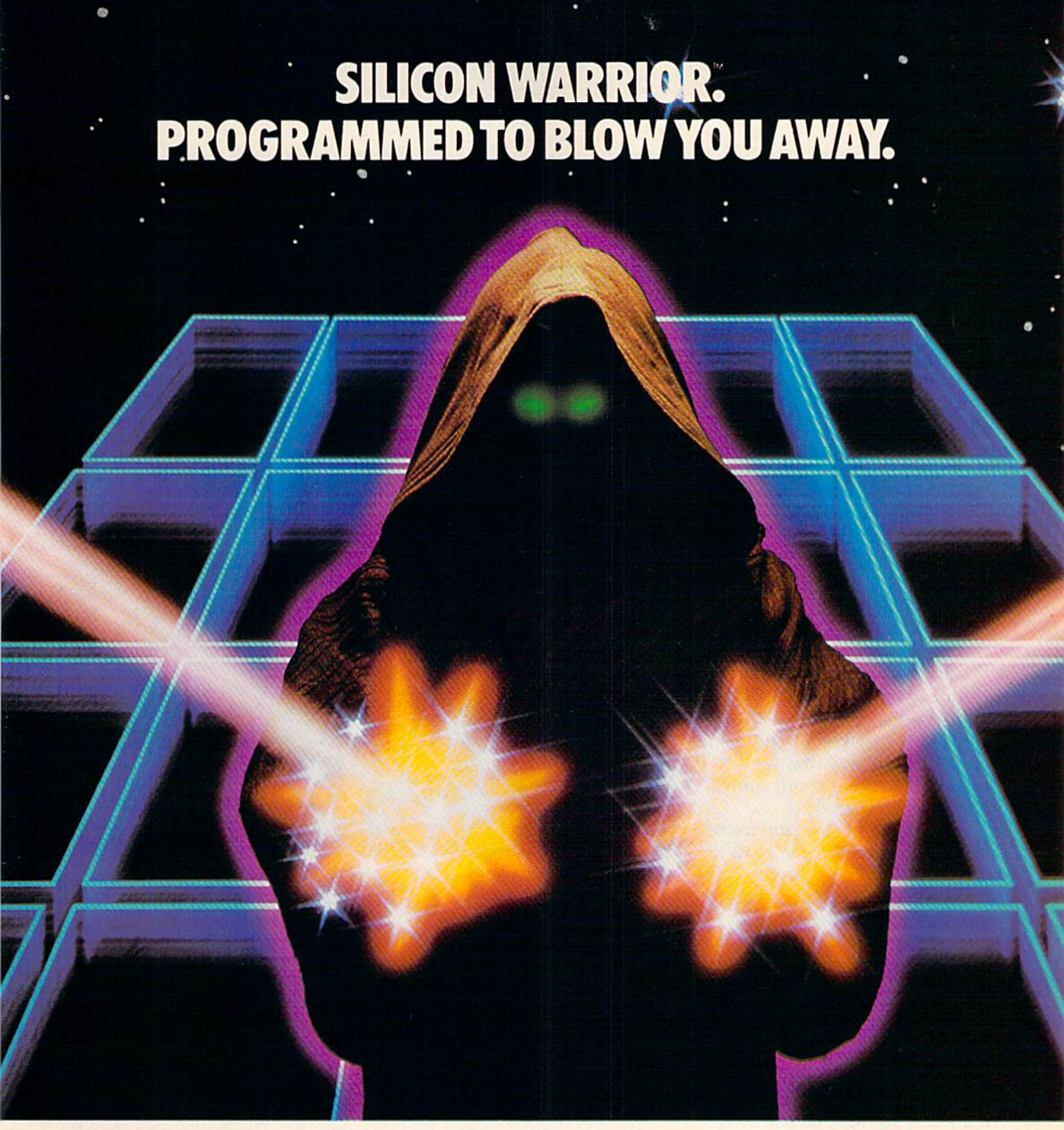

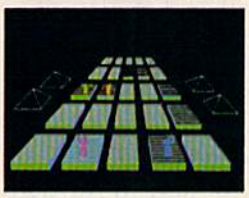

The year is 2084, and the Silicon Valley is enveloped in a conflict of the fiercest magnitude. Warriors from the House of Peanut, the House of Apple, the House of Adam, and the House of Pong are competing for a computer program which will unravel the mysteries of the Universe and lead to eventual domination.

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One to four players; joystick controlled.

EPYX™ COMPUTER SOFTWARE

Strategy Games for the Action-Game Player

as he thought it was. Yes, said the consultant, you have something extremely special. I can get you a contract.

And he did. With McGraw-Hill, who saw Snyder's simulations and bought all five packages immediately. Snyder's experiments with computer-assisted group learning became the Search Series, a group of classroom simulations for grade-school children, which still sells well four years later.

"The best software requires teachers."

Snyder recalls one time when a student, after participating in *Energy Search*, went home and told his parents, "The neat thing about it was that we got to make decisions about things that really mattered."

But some of the grown-ups weren't so sure. On the road in 1981 to promote his series, Snyder was asked the same question over and over: Isn't this kind of software dependent on exquisite teaching?

No, he said for a long time. Anyone can use this approach. It's good for everybody.

"What I've learned now is that this stuff requires a good teacher, and good teachers come in a lot of forms," he says. "If someone comes up with teacher-proof software, that's just the beginning of the end. As soon as we start making software that runs itself, we're all losing control."

"You don't work by committee in art. You don't in software either."

About the same time Snyder was writing simulations for his classroom, the personal computer industry started to pick up speed, and Snyder had a new market for his learning discoveries: home educational software. "I met a couple of guys named Bill and Dave who were thinking of starting an educational software company, and converted one of my school programs for home use. That was the first program they published."

That program was *Snooper Troops*, the company was Spinnaker, and "Bill and Dave" were William Bowman and David Seuss, now Chairman of the Board and President at Spinnaker. *Snooper Troops* became the first educational game to make a software industry bestseller list.

In January 1982, Rick Abrams, a young financial consultant, entered the picture. With Snyder, they began building a corporate structure to channel Snyder's dreams into the burgeoning home computer market.

Over the last two and a half years, Tom Snyder Productions has grown from a staff of two operating out of a third-floor apartment to offices in Harvard Square with a staff of 17 software artists, writers, and other support people. Their profits grew from less than $50,000 in 1981 to more than $500,000 in 1983.

Software development group Tom Snyder Productions.

But not without stumbling a few times. "I had a few disasters just hiring programmers and having them program my dreams," says Snyder. "That undervalues programming as an art, as a personal passion."

So what he had to do was to "...go through the laborious approach of finding dreamers who wanted to get excited about some approach, then let them

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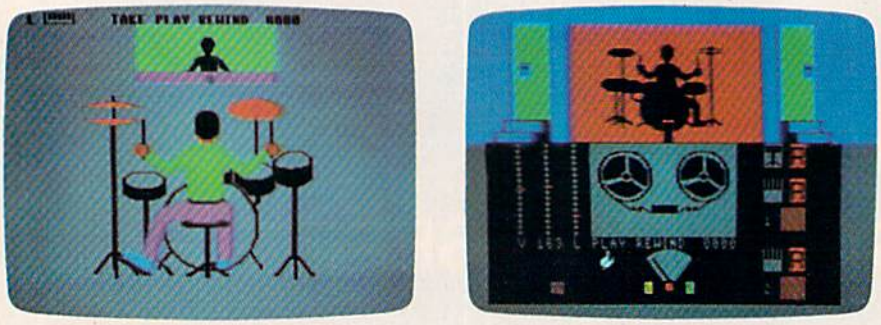
work and design on their own," he says.

Snyder discovered something interesting along the way. A female visitor to the office one day had criticized a program for being sexist because all the characters looked like men, but loved another program for some reason.



TSP's latest program, Rock 'n Rhythm, *turns your computer into a recording studio.*

The reason, believes Snyder, is that it was programmed by a woman. "The trick is not just to have women designing the software, but programming it," he says. "It became so obvious to me that we had a lot of women designers, but they were handing them to men to program.

"The 1.5 million judgment calls that Gabrielle Savage made [when she programmed *Spelldiver*] were a women's decisions, choices of shape, color, position, pacing, plot.

"If women are just using tools that men build, they're not finding out what the computer is capable of, given your particular fantasy. A graphics person who is not willing to find her own tools is like a cabinetmaker who has no say over what tools he uses."

The lights are seldom out at 123 Mt. Auburn Street in Cambridge. The staff of Tom Snyder Productions is encouraged to reach their speed, get into their own pace, however strange those hours are.

"Like most software development teams, we try to keep corporate culture out," says Snyder. Art, recording, and technical studios, as well as private offices ("no cubicles *here*") help sustain that, as do frequent weekend trips together.

Snyder's analogy for that team's relationship to the rest of the industry is a television production crew. "Something like a group that is trying to have several hit series on the air at once," he says. "There's a lot of separate creative production, but they all share production facilities."

And his "hit series" have been picked up by some of the top educational software publishers: *The Search Series* by McGraw-Hill; *Snooper Troops, In Search Of The Most Amazing Thing, Fraction Fever,* and *Rock 'n Rhythm* by Spinnaker; *Agent U.S.A., Spelldiver,* and *Bannercatch* by Scholastic, Inc.; and *Run For The Money* and *Making Millions* by Scarborough Systems, Inc.

"It's one thing to do your dream; it's another thing to hire a lot of people and then have to lay them off because you haven't made ends meet."

Treating software development as a creative art raises a fundamental question: Do you design programs that satisfy you artistically, or things that you know will sell?

It's not so impossible to do a little of each, believes Snyder. "There are restrictions in a commercial market, but that doesn't have to be the end of the world," he says. "It's like a sonnet. That has some pretty explicit rules to it, but there are an infinite number of ways you can write one."

And that thought satisfies him for life. "I love working within tight restrictions. Anything has restrictions except for jazz," he says. "Take the pop song, the two-minute-forty-eight-second song—there's so much you can do. The world has realized that that's just limitless. Symphonies had to go through lots of transitions, but the pop song continues to amaze people with what can be done."

"When we successfully eliminated Nancy Drew from our book list, we may have done something good for proper English but we might have done a bad thing overall for kids' investment in learning."

As Snyder's software development team continues to chip away at the boundaries of home education, Snyder is turning his attention back to where everything started for him: the schools.

"I've stayed away from the school market for a few years, but now I'm looking back and seeing that the kind of stuff done for schools is still the one-on-one stuff: one kid, one computer," he says.

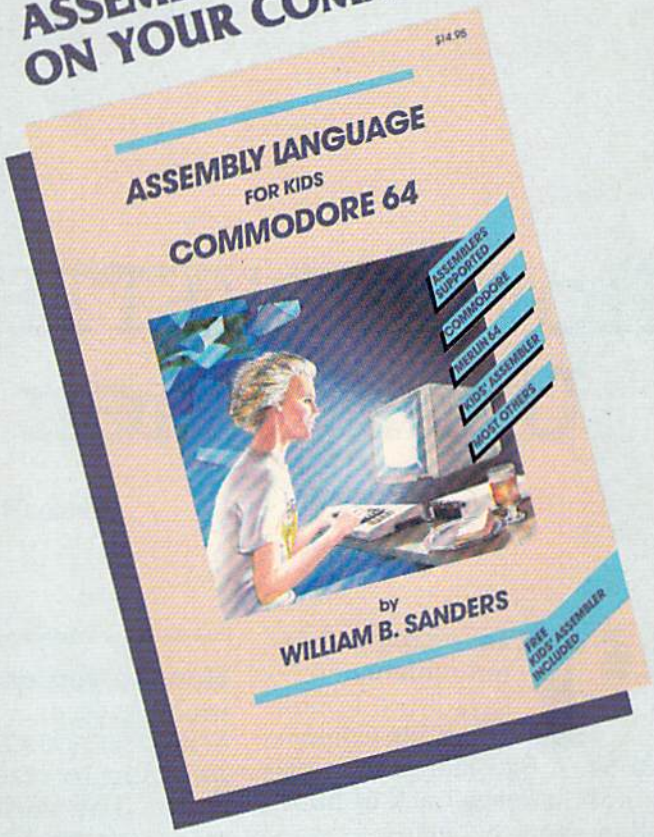
Further, he's concerned about the struggle that schools are going through trying to incorporate microcomputers into their teaching process. "There is an erroneous promise, an implication that you're going to be able to do quantifiable things with computers. Therefore, it's excited educators and educational consultants who say, finally, we can start pinning down this educational beast.

"Whereas good software designers come along and say, sorry, this is no more quantifiable than a good book or a bad book. It's an extremely flexible medium and we're going to have to learn to use it just as slowly as we learned how to use good fiction and good art."

So he's back to designing group simulations.

"I'm so excited to be doing it again. I feel very morally clear every day when I'm walking to work," says Snyder. "It's cool to think of the computer handling groups of kids well." ■

LEARN ASSEMBLY LANGUAGE ON YOUR COMMODORE 64



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How GAZETTE Readers Are Using Their Computers

Bernie Ghiselin

How do you use your Commodore 64 or VIC-20? COMPUTE!'s GAZETTE put that question to readers in 34 states. The variety of answers we received from this informal survey reveals just how versatile these computers—and their owners—can be.

"I am totally and utterly infatuated," says Bruce Kobrin about his Commodore 64. A San Francisco minister, Kobrin keeps track of information about his many parishioners by using his computer.

"It's just kind of fun to play with," Roger Brensinger says about his VIC-20. Brensinger, an air traffic controller in Waco, Texas, admits he also computes loan amortization figures and is interested in a biorhythm program for the machine as well.

But the biggest reward for Brensinger is in watching his five-year-old son—"It's helping him to learn to count and recognize numbers"—and his two-year-old daughter—"She just turns it on and listens to the sound. She doesn't know what she's doing yet, but she enjoys just sitting by it."

From educating children and playing games to helping with home productivity chores and learning to program, COMPUTE!'s GAZETTE readers are using their Commodore computers for a multitude of purposes.

Some homes have too many fingers chasing too few keyboards.

"We fight over it," says Natalie Adams, a resident of Avon, Colorado, whose 15-year-old son, Tim, usually beats her to their computer.

"Whenever I'm not at it," says Ron Long, "they [his wife and children] get a chance occasionally. The grass is about a foot high out there right now." Long, a school teacher in Ada, Oklahoma, has had both a VIC-20 and a Commodore 64. He spends up to five hours a day on the computer.

The situation is reversed for John Norton, an editor in Pueblo, Colorado, whose children dominate the machine: "It's hard for me to get near the thing." And Stephen Gaudet of Rumford, Maine, insists: "I'm telling you, it's on all day long. When somebody's at home, it's on."

Commodore owners may talk about their interests in computer-based learning software, programming, or simply getting familiar with computers for themselves and their children, but the use most often mentioned in our reader survey was—not surprisingly—education.

"The original purpose was education for me and the children," says Jack Adkins of Bethany, Oklahoma. "But it progressed into a hobby."

"Primarily for the kids to hack with," offers E.F. Gormel of Cape Canaveral, Florida, in response to a question about why he purchased a computer. "To get them familiar with the keyboard."

Even if a parent buys the computer for personal use, there is often a son or daughter somewhere in the background, learn-

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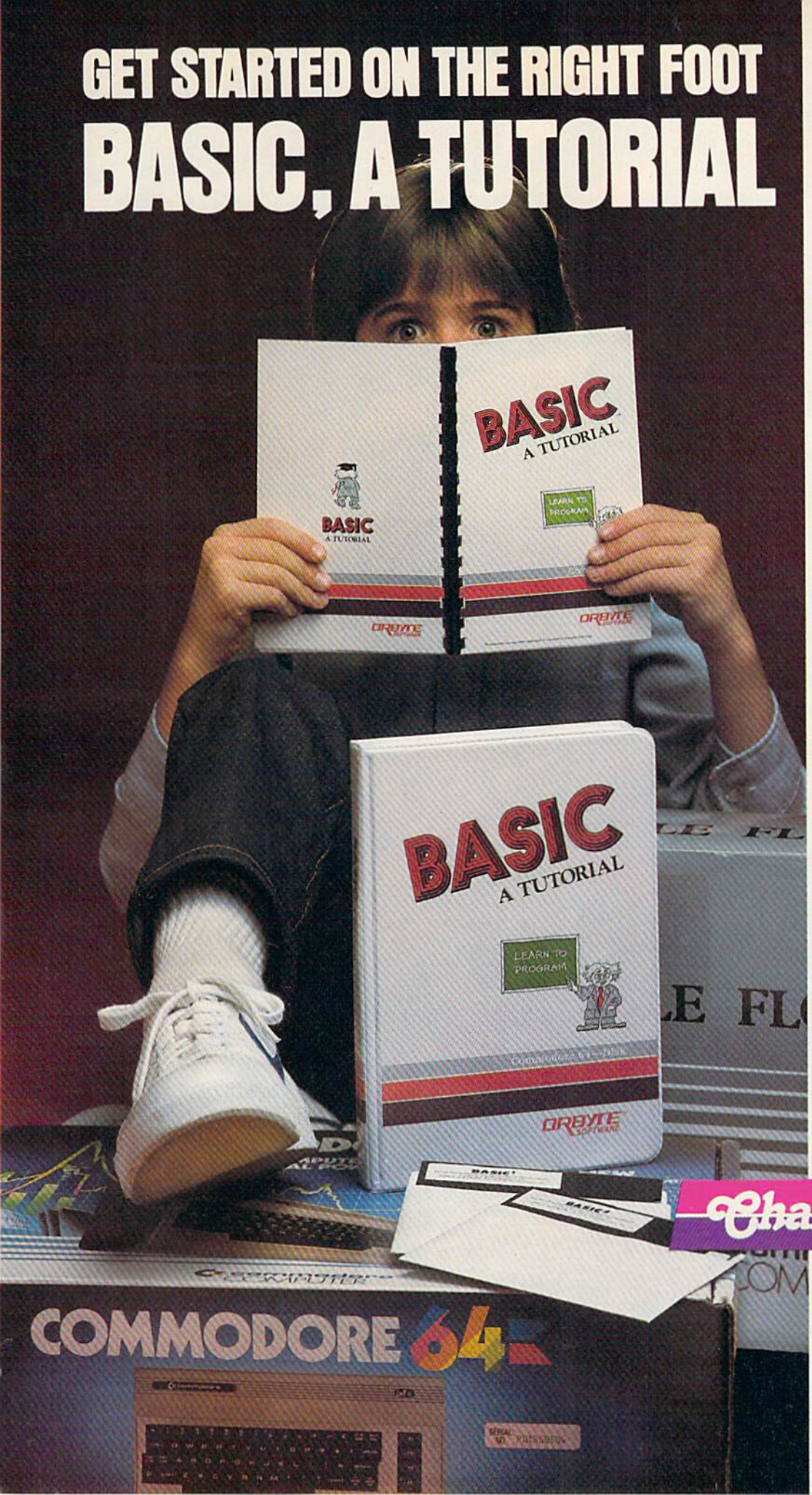
BASIC, A TUTORIAL



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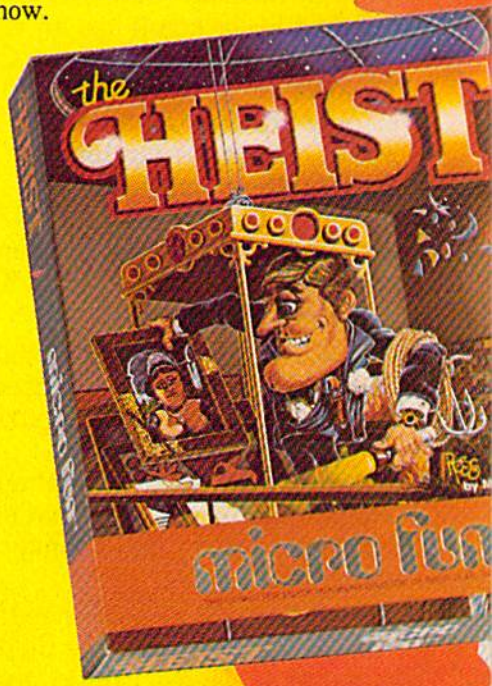

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ing BASIC, playing games, or writing school papers on the computer. And the frequently unspoken reason—although almost always a factor—seems to be the thought that those children need to be exposed to computers as soon as possible.

For example, when Frank Graham bought his Commodore computer, he didn't think his children, ages 5, 7, and 13, would become wizards of the keyboard. But Graham, a news director for WTAE-TV in Pittsburgh, didn't want them to face the silicon society in fear or ignorance of computers. "All three know what it is and are not afraid to sit down and work with it," he says.

The enthusiasm of Commodore owners we contacted is typified by Jack Adkins, an efficiency expert for Oklahoma City Schools: "I've talked 15 or 20 people into buying one at work," he says. "I'm loaded down with just about every game for the Commodore 64." At last count, Adkins' software collection contained about 150 disks and was still growing.

An interest in educational computing and an enthusiasm for the computer came together for Shirley Watson of Fort Worth, Texas—but not without some initial convincing that a computer wasn't just a fancy game machine.

"I thought, 'I don't need this. If you can show me there's something else we can do, then OK,'" she says. "After about three or four months I was amazed at all the things I could do."

The family's VIC-20 has helped her son, David, now 11, to learn his multiplication tables. And between Shirley's and the children's use of the VIC-20, her husband George was forced to buy a Commodore 64 just to keep peace in the home and get an opportunity to use it as well.

Shirley Watson carried her new-found interest to the PTA and a fourth-grade class at a local elementary school. "I brought a little math program, and I took about ten minutes with each child and asked them if they'd worked with a computer before," she says. "They picked up on it right away. It seemed complicated until we sat down and ran a little routine through."

Watson's presentation was so convincing that the PTA and the school principal authorized money for the purchase of a Commodore 64, disk drive, color monitor, and software.

Although computer gaming remains popular among readers, it's clear that educational programs are drawing an increasing amount of attention.

Not long after that, five other teachers bought their own computers to keep in the classroom.

The cautious first approach and later conversion to computing have been typical for many of the GAZETTE readers contacted.

"I felt intimidated by it," says Sara Miller, a teacher in Sterling Heights, Michigan. "I felt it was smarter than I was. I wanted to learn it and get my kids through that kind of feeling. I hope my kids will be comfortable when it comes to learning BASIC in junior high school. If that's all I get, I'll be satisfied."

Another concerned parent, Barry Arnes, is gently guiding his four-year-old son, Robbie, into the world of computers. "He sits in my lap and we have a sound demonstration tape. We play *Pac-Man*. And he's picked up his sight vocabulary in the last four or five months," says Arnes, a high school science teacher in Philadelphia.

"He's learning some of the commands, and he *loves* to erase. I type in something, and he hits 'delete.' He thinks that's great. Sometimes we play *Avenger*, but that's frustrating for him," he adds.

The list of uses for Commodore computers is a long one. Sequencing grow-lights for plants is something Bruce Hartigan of Ferrisburg, Vermont, wants to use his VIC-20 to coordinate. Another reader, 16-year-old Eric Jordan of Hiram, Georgia, uses the VIC he bought mainly to help with his math classes: plotting graphs and trigonometric and exponential functions.

"The computer is so much faster. I don't have to work it out the long way," he says. "I had to learn it all myself."

In Brooklyn, New York, Suzanne Bennett, 17, is using her computer in an accounting course and for word processing in her English classes. Across town in Queens, Mark Peress, also 17, is writing his own data base and filing programs. He has learned BASIC and is now working on COBOL and Pascal. Among his creations so far is a space shuttle simulator.

"You have to figure out the speed of the launch," he says. "If it's not enough, you crash. It does orbits, lines up with the runway, reentry, everything."

A few teenaged readers are not only using their Commodore computers for their own school work; they're helping others manage their affairs. In

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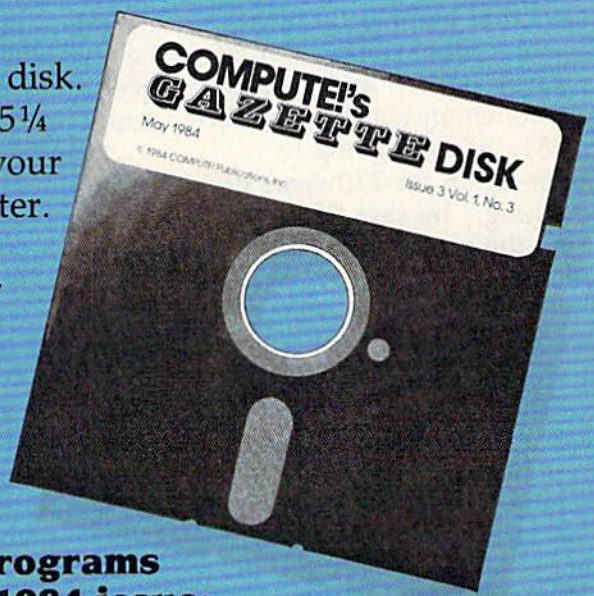

Here are just a few of the quality programs which appeared in the September 1984 issue:

- *80 Columns For The 64*—A two-program package including "Screen-80," which converts the 64 into an 80-column machine, and "Custom-80," which lets you create your own 80-column character set with a joystick.
- *SpeedScript Customizer*—Tailor the output of your VIC or 64 version of SpeedScript with this easy-to-use menu-driven program.
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- *Power BASIC: Screen Headliner*—Make your own headlines on your VIC or 64 with this routine that expands characters to four times their normal size.

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Deerwalk, West Virginia, Andy Hall, 15, is writing a data base program for a nearby sports shop—"an inventory list for sports equipment, so they don't have to write it down each time," he says.

Among Andy's more challenging programs was a science project that graphically illustrated the triple conjunction of the Earth, Jupiter, and Saturn—a phenomenon which took place in 1981. "It's not going to happen again for 270 years or something," he says. If he had turned the project in on time, he would have had an "A," Andy admits. But he did win first place in an after-school science fair with his program.

Marvin Winston is proving invaluable to his mother and his karate instructor because of his computer. The 17-year-old Conway, Arkansas youth is using a data base program to help his mother, a nurse, keep track of about 1200 employee accident records. And he's organizing lessons and listing karate movements for his karate instructor.

To dazzle his English teacher, Marvin created a graphics program which simulated the death scene with Brutus from Shakespeare's *Julius Caesar*. Using sprites, the program includes text, swords, and music. "She really liked it," he says.

Many GAZETTE readers get their biggest enjoyment from the sense of accomplishment that comes with mastering a programming technique or a computer function: "The feeling that I did it all by myself!" one high school student says. Adds a teacher, "Just having the computer perform something I want it to do."

Although computer gaming remains popular among readers, it is clear that educational programs are drawing an increasing amount of attention. And there are those who find that education and entertainment have a common ground.

A favorite game for Bertram Rhoads, Jr., a 70-year-old semi-retired insurance salesman in Philadelphia, is a complex blackjack game which he wrote himself. With the help of his son, a systems analyst in Chicago, he's now writing what he feels will be an improvement over the blackjack games currently on the software market.

The new program includes a random factor which simulates the gambling odds at Atlantic City card tables, he says. "The computer is the dealer," says Rhoads. "It still has to play the rest of the hands around the table. When it finishes with the last player, the computer reveals what his down card is and whether he hits or stays. Then the computer goes around and tells you whether you won or lost."

One of the most enthusiastic groups of GAZETTE readers is composed of teachers who are finding a variety of ways to use their machines.

Los Angeles high school teacher Jerry Woodrome has written what he calls a subliminal reading program for his own children, ages four and six. The program simply uses a counter and a loop, flashing a word on the screen 1500 times before skipping to the next word. The program helped his daughter's reading comprehension in two days. "It about blew my mind," he says. "I didn't realize it was that efficient."

The first teacher to suggest using a computer at Indian River Junior High School in Chesapeake, Virginia, was GAZETTE reader Kathy Dulaney, an eighth-grade teacher. She brought her own VIC-20 to school and began using simple vocabulary exercises. "We can change vocabulary from week to week," she says, "erase their data and then put in our words."

At the younger levels, William Arnold is a GAZETTE reader who teaches computing in Cape May, New Jersey, elementary schools. "I'm just trying to get them familiar a little bit, so they won't be intimidated by the keyboard," he says. "They love it. They want to know everything about it." Among the programs that he's written is a letter recognition game for youngsters.

At the Oklahoma School for the Deaf, the students have warmed up to computers in a big way, say Ron and Elaine Long. The Longs teach at the school and have used the machines extensively.

"Most of the programs have a picture or something of identification," says Ron. "It's more fun. The deaf have a lower reading level. They don't get the input a hearing person does."

Before the arrival of the computers, few of his students could pass the driver's license test. Then they put together a computer-based tutorial. The result? "Everybody who's used it has gotten 100 percent," says Long.

Despite the heavy emphasis on educational uses and gaming, GAZETTE readers are involved with many more areas of interest as well. There are ham radio operators using their computers to read Morse Code. Real estate, commodity, and stock brokers are running programs that organize their trading activities. Whether they are college professors, hospital managers, business executives, or any of a hundred other occupations, readers are using spreadsheets, data bases, word processors, and other applications.

In Houston, Luther Barnhill keeps track of monographs for his academic papers. A retired mycologist with the U.S. Department of Agriculture, Barnhill may need to list 150 abstracts for a single paper on which he

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The performer explained that *BLITZ!* translates the slow BASIC language into a much faster code, thus improving the performance of the BASIC routines. *BLITZ!* reads the entire BASIC program, decides which operations only have to run once, and compiles the operations. It then re-writes the program into its special P-code.

Skyles also showed how *BLITZ!* adds security to your programs, because once a program has been compiled, it is not readable. That means protection is an automatic part of the re-writing.

The highlight of the show was, for this reviewer, when *BLITZ!* compiled a string of BASIC programs such that one loaded the next. An impressed audience looked on as Skyles effortlessly passed information from one program to another.

***BLITZ!* on disk for the Commodore 64 costs only $99.00.**
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is working.

Denise Van Dosen of Marine City, Michigan, keeps track of Girl Scout activities with her computer. Policeman Dan Mathena of North Granby, Connecticut, records arrests, cars stopped, mileage, and other figures. "It helps me to see things I couldn't see before," he says. "Now we can know the percentage of drunk drivers [as compared to] motor vehicles stopped."

When she can wrestle her children away from the computer keyboard, Natalie Adams of Avon, Colorado, uses her Commodore to keep track of condominiums for a local management company and for mass mailings to the homeowners' association.

In Seneca, South Carolina, lab technician John McDonald has reached the point where he can send out his own programs for possible publication in computer magazines. He even successfully interfaced his VIC-20 with a home burglar alarm, although the initial efforts produced some overheating. "But it *did* work," he says.

Among the programs McDonald has created which his family finds useful is a grocery shopping list data base that includes about one hundred items. "We buy basically the same things, but not the same thing each time," he says. "We pick out certain items before we go, and it gives us a subtotal of the grocery bill before we go there. I know we save ourselves money. We know when we go what we want and don't let ourselves spend more."

Dale Bishop sells ads for a telephone directory publisher, and he takes his VIC-20 along on the road trips. The Vandalia, Illinois, salesman plugs the computer into his motel room's television set for a few quick games.

The Rev. Jack Skirvin, a country pastor for 33 years, is getting plenty of use out of his Commodore 64 at the M46 Tabernacle of the Pentecostal Church of God [M46 is a highway] in central Michigan.

He has started a Bible school on Saturday mornings, and uses word processing for his notes and quizzes. A data base program helps him keep track of about one hundred families. And he uses his printer for mass mailings. Skirvin is even writing his own data base program now. "I would like to include more information for each family," he says.

Skirvin says he's probably one of a minority of ministers around the country using a computer the way he does. "There are not too many of them that have a similar interest."

But when it comes to computer use, he admits he knows the shape of the future. "I see it mostly among the young people of the church." ■

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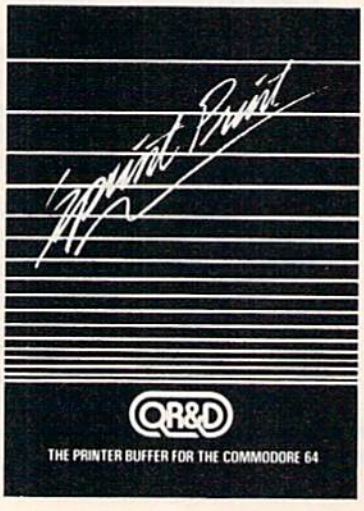

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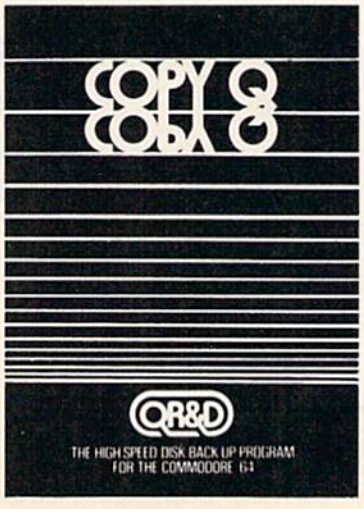

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Unknown to you, however, a defective coupling in the main power housing is unable to support the added strain. When it fails, you temporarily lose warp drive. In the process, the ship's dilithium crystals are destroyed. The ship must proceed on auxiliary power until new dilithium crystals can be acquired.

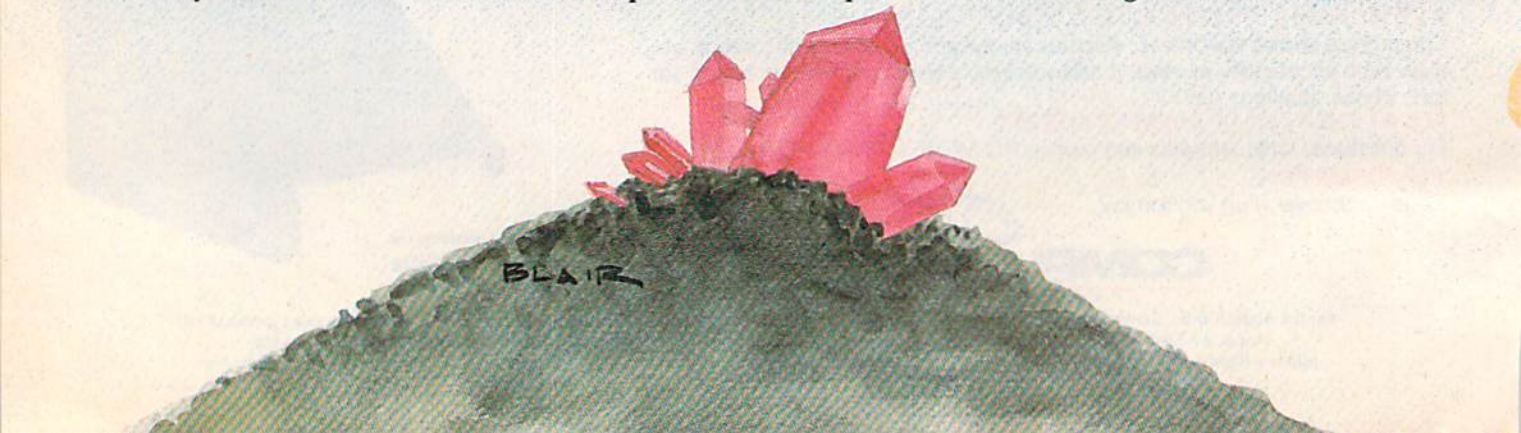
Long range sensors indicate a nearby planetoid that contains the needed crystals. Unfortunately, the planetoid is guarded by numerous drones, normally not much of a threat. However, with shield energy so depleted, they can become a deadly menace. In addition, there is a plasma cannon on the surface against which the ship's shields are totally ineffective.

Upon arriving at the planetoid, a mining team is beamed down to the larger of two mountain ranges. While avoiding the drones you must beam up the mined dilithium crystals. Fortunately, phasors are operational. You are reluctant to use them, however, because of the associated energy drain.

Avoiding The Drones

When the program is run, the screen clears and a wait message appears. At this point, the program is moving the character set to $3800(14336). This is done to reduce sparkle, which interferes with the sprite collision registers. Then the program asks you at what level (1–4) you would like to play. This determines two things: how fast the drones adjust their orbit to collide with the starship, and how active the plasma cannon will be. Once fired, you must avoid the plasma ball from this cannon at all costs. It will destroy your ship on contact.

Fortunately, the drones do not affect your shield energy while the plasma cannon is firing. The plasma ball has enough fuel for about two



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full orbits. In normal mode (no plasma ball), the drones cost about 15 energy units per hit. If shield energy is depleted, the starship will crash and the game is over. Phasors will destroy the drones, but no points are awarded since your mission is peaceful, and weapons are defensive. It should be noted that phasors do cost energy. If used sparingly they can help; but, generally, avoid using them.

When the game ends (either by completing two orbits or by being destroyed), you will be asked to play again (P) or end the game (E).

Your mission is to find energy crystals while avoiding the irksome drone ships.

Ship Operation

The ship's controls are: the cursor keys, which provide positive and negative orbital thrust; the space bar which engages phasors; and the T key, which controls the operation of the transporter. This can only be used directly over the large mountain and while in a low orbit. The mountain will flash yellow and the shield energy will increase as new dilithium crystals are beamed aboard.

The score is based on the time that has elapsed since the start of the most recent game minus the number of direct hits on the starship. The high score of the last successful game is compared to that of the present game and the result is logged under high score.

Machine Language Routines For Special Effects

The action in "Trek" is controlled almost exclusively from machine language (ML). The ML routines are in modular form accessed from BASIC via SYS commands. The various memory locations are assigned variable names, such as "SYS THRST" (thrust) and "SYS MOVE".

A list of these ML modules is included in the accompanying table along with a brief description of their individual functions. These commands serve as extensions of BASIC. They are independent of one another and thus are available individually for use in programs other than "Trek." These modules are grouped together via BASIC in lines 100–200, which form the main loop of the program. In addition, lines 8000–8035 form the plasma cannon loop.

Machine Language Modules

ML Routine	Memory Location	Function
BAM	49407–49459	Checks sprite collision registers to see if drones hit starship (sprites 1, 2, 0 against 3) and moves eliminated drones off screen.
MOVE	49232–49275	Checks to see if sprite 3 is above or below the drones and moves sprites 0, 1, 2 up or down if so.
PHAS	49472–49531	Checks to see if space bar is depressed and rapidly scrolls sprite 6 (phasor) across screen if so; also checks for collisions between sprite 6 and sprites 0, 1, and 2.
Main loop	828–886	After being called by the hardware interrupt, this routine scrolls sprites 2, 4, 5 one pixel to the left. It scrolls sprite 1 two pixels and sprite 0 three pixels.
Hardware Interrupt reset	989–1002	This must be called before the main loop machine language above can operate. It tells the IRQ to look at 828.
THRST	890–951	Checks keyboard to see if either cursor key is depressed and scrolls sprite 3 up or down if so.

Another area where ML is used is in the scrolling of the background. This is a routine inserted into the interrupt routine performed 60 times a second. This inserted routine allows the mountains and drones to be scrolled across the screen without taking time out from the main loop. This also makes the play much smoother.

Lines 600–899 contain the DATA statements that comprise the ML discussed above.

Lines 500–598 contain the sprite DATA statements. Lines 900–998 set up the playfield. Lines 1100–1379 contain the introduction screen. The lines at 3000 control the game restart and associated variable resets. Finally, the lines at 4000 control the victory screen received after the successful completion of this phase of the mission. The other lines are for the most part self-explanatory.

Sound in Trek has been embedded as much as possible to maintain smooth action.

If you would like a copy of Trek (tape only) send a self-addressed stamped envelope, a blank tape, and $3 to:

Andrew Beery
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See program listing on page 172.

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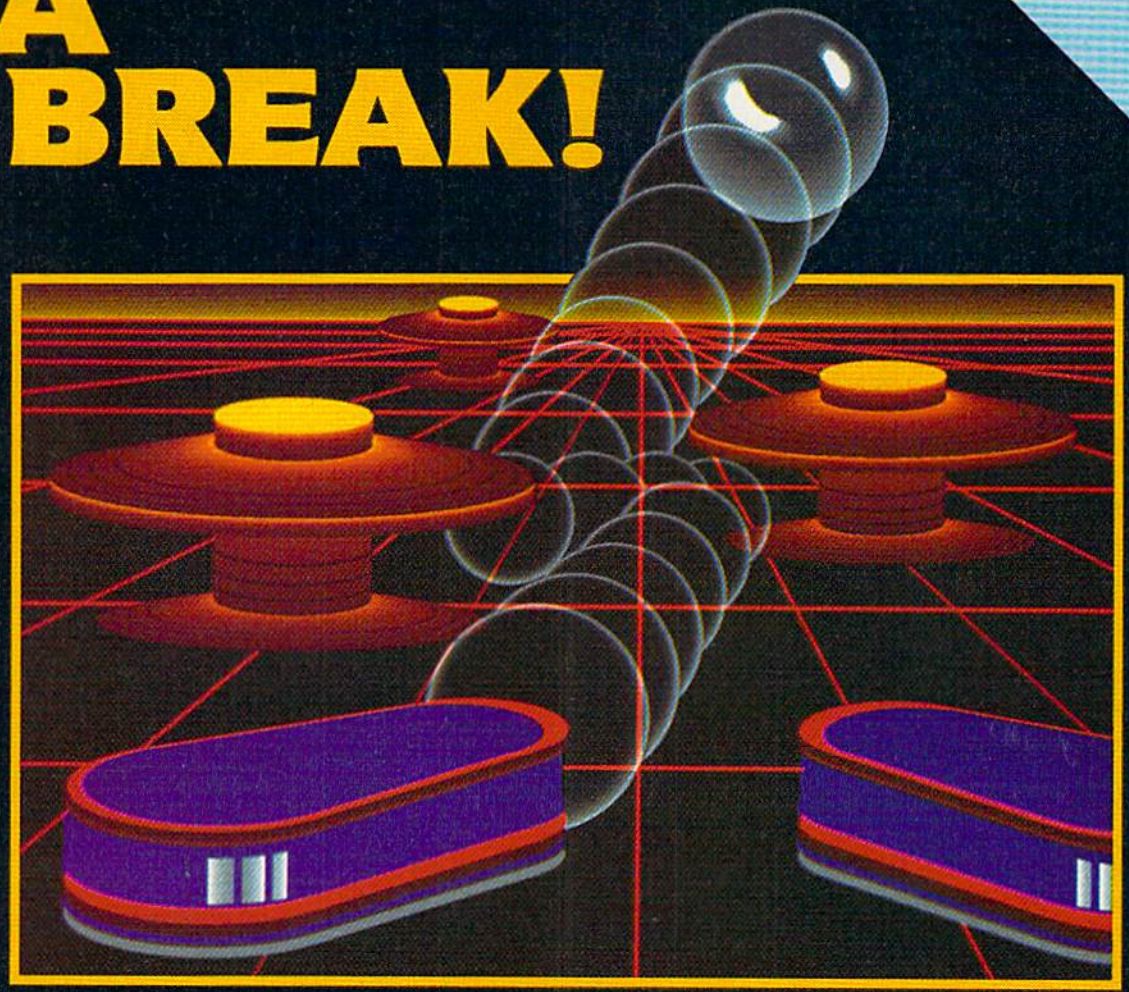
For Commodore 64



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The Tomb

Mike Scharland

You're in the labyrinth of an ancient Egyptian tomb, searching for treasure. Getting through the maze to the treasure while evading the tomb's guardians is the challenge. For the VIC and 64, a joystick is required.

You are a brave Egyptologist, seeking relics and treasure in the pharaoh's tomb. Using a joystick to maneuver your character, you must evade the three guardians of the tomb to retrieve the treasure from its resting place in the wall.

Inside the treasure room, many columns and walls form a labyrinth to hinder your progress. You cannot pass through these walls, but neither can the guardians. The amount of treasure you find depends on how quickly you travel through the labyrinth.

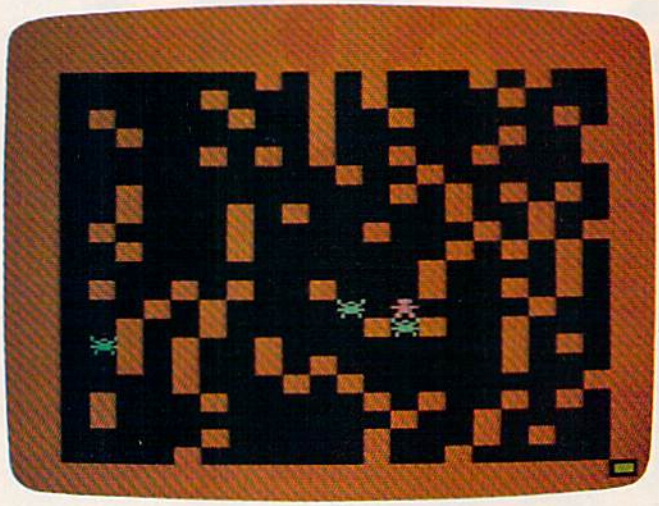
This program consists of one very short main loop and a large number of subroutines. The main program loop, lines 18–91, is designed for speed. There was no need for a vertical wraparound feature to prevent you from appearing on the other side of the guardians by going off the screen. The screen border is made of the same character which is used for the walls. The regular program loop checks for and does not allow a move into one of these characters, so you cannot move off the screen.

The subroutine at line 2000 creates the random screen. The subroutine beginning at line 3000 creates the custom characters. The subroutines beginning at lines 4000 and 5000 are used when you either meet your end or grab the treasure.

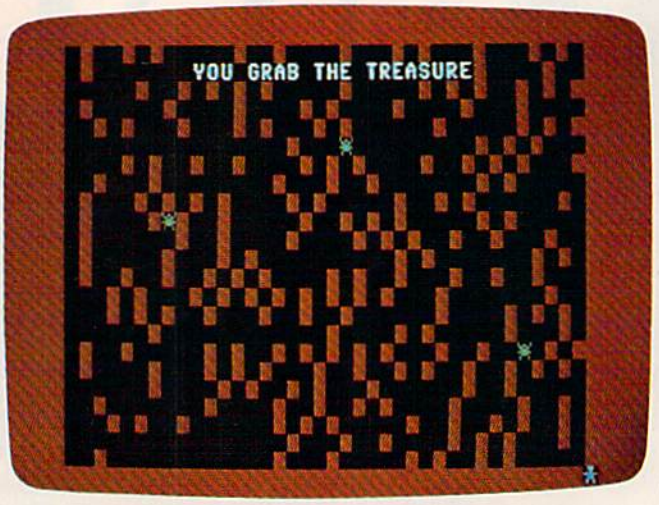
If you don't want to type this program, send me a blank cassette, SASE, and $3. I'll return your tape with two verified copies of the program (VIC version *only*).

Mike Scharland
3640 Halsted Blvd.
Steger, IL 60475

See program listings on page 151.

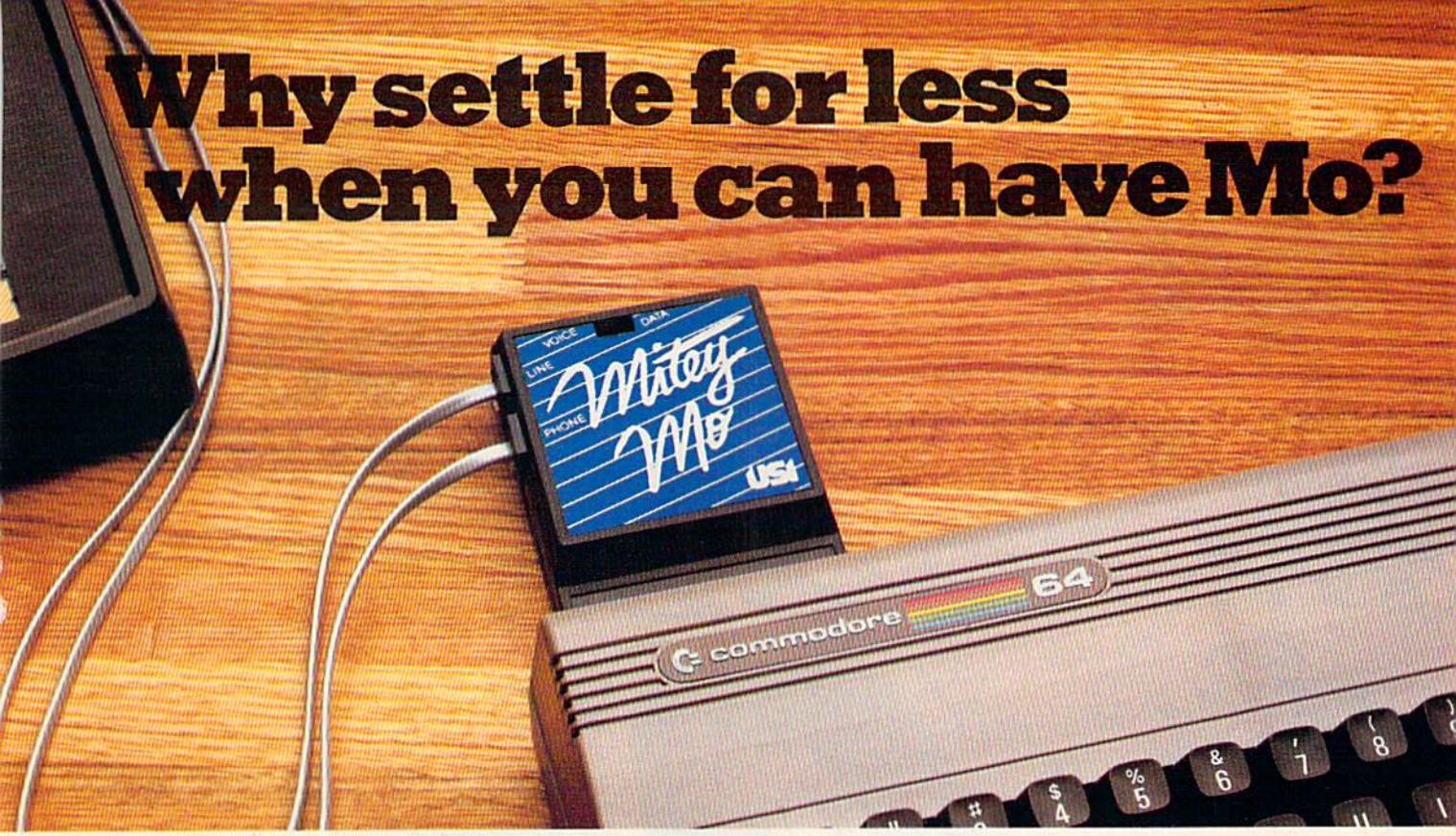


Two guardians are about to capture the player in the VIC version of "The Tomb."



The intrepid explorer has made it through the labyrinth (64 version).

Why settle for less when you can have Mo?



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Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for the C-64. Like Mitey Mo, it has "auto-answer"— it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where their similarity ends.

Suppose you dial a number,

MODEM FEATURES	USI MITEY MO	COMMODORE AUTOMODEM
Auto Dial	YES	YES
Auto Answer	YES	YES
Auto Redial	YES	NO
Smooth Screen Scrolling	YES	NO
Both Cassette and Diskette Software Included	YES	NO
Menu Driven	YES	NO
24K Software Buffer	YES	NO
Function Key Template	YES	NO
Printing Capability	YES	NO
Easy-to-Use Manual	YES	NO
Bell 103 Compatible	YES	YES
Multiple Baud Rates	YES	YES
Dual Cables Included	YES	NO
Single Switch Operation	YES	NO
Warranty	3 years	90 days

Some mighty interesting features—ours and theirs. Yours to decide.

and you find that it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.

Mitey Mo is menu-driven. It lists the things you can do on the screen. Select a number and you're on your way. Since Automodem isn't menu-driven, you'll be hunting through the manual a lot.

Mitey Mo has only one switch, the customized software does the rest. Every family member will find it easy to use. With the other modem you'll have to remember to check three switches, otherwise you may be answering when you mean to be originating.

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USI

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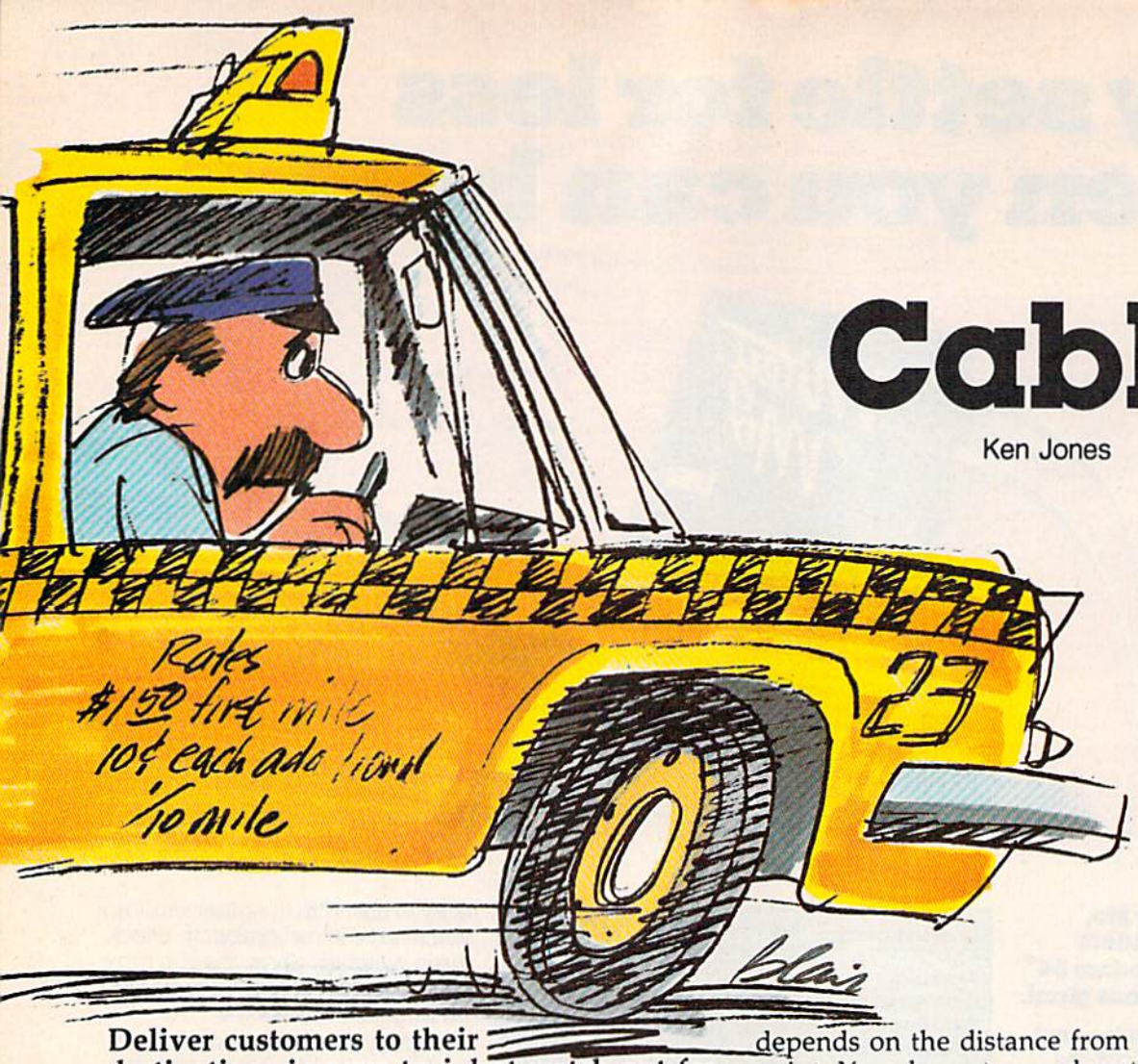

Cabby

Ken Jones

Deliver customers to their destinations in your taxi, but watch out for the vicious trolley cars, and try not to run out of gas. For the VIC (with at least 3K expansion) and 64. A joystick is required.

The object of "Cabby" is to drive your cab around the city picking up passengers and dropping them off at their desired destinations. If you earn $200 and get all the money back to the depot before wrecking your hack, you get to buy your cab and win the game.

Using The Radio

Messages sent from the dispatcher are flashed on the bottom lines of the screen. The messages tell you to go to the airport, go to the zoo, etc. Head for the appropriate letter on the map (the first letter of the name of the location). You cannot pick up passengers at any destination except the one to which you have been dispatched. The one exception to this rule is the street man, who appears randomly from time to time hailing your cab. You can pick him up anytime your cab is empty.

After picking up a passenger, you must take him or her to the required destination, which appears at the bottom of the screen. Your cab fare depends on the distance from pick up to drop off point. You also get a random tip proportional to the fare collected.

Trolley Cars And Traffic Lights

Trolley cars hate cabbies and will crunch you any chance they get.

You can pass a traffic light only if it is green. A red or yellow light stops you in your tracks.

To make things even more sticky, you have to watch your gas consumption. Pushing the fire button on the joystick gives you a gas gauge readout on the lower portion of the screen. If your tank is near empty, head for the gas pump near the bottom right of the screen. You'll hear a pump sound when filling up.

Don't get caught heading for a red or yellow traffic light with a trolley car close behind. Chances are it will not change in time to save you from your fate. The trolley movement appears to be random and no threat to you until you move into its line of sight. But they bear down on you when they see you.

Don't wait too long to gas up. If you run out of gas, the trolleys get nine turns (the time it takes you to walk to the gas station and back with half a tank of gas) to close in. Head for the pump when it's clear of trolleys. Most of the time there

All roads to the best strategy games for the C-64™ lead to SSI.

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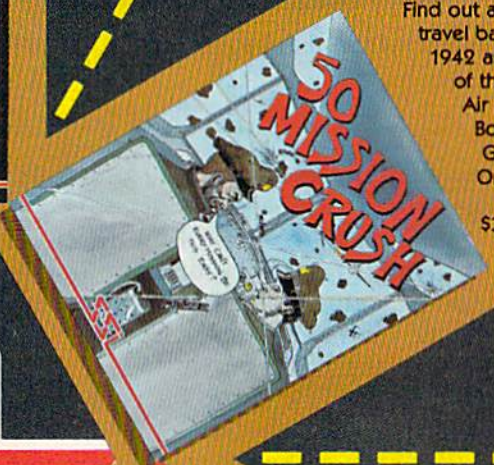

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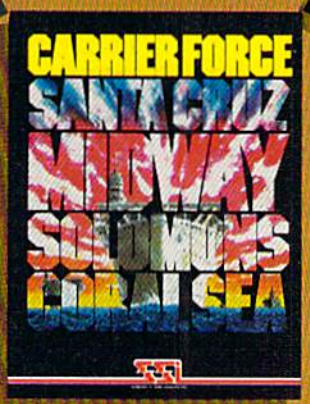

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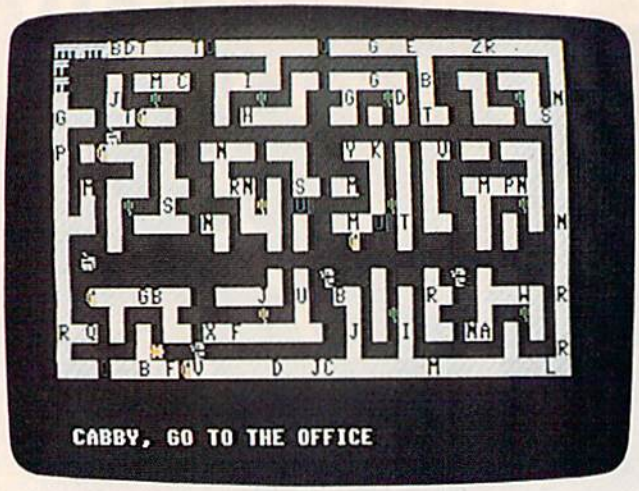


Deposit money in the depot to keep it safe (VIC version).

The dispatcher's messages appear at the bottom of the screen. A customer is waiting at the office (64 version).

is one guarding the pump, making it difficult to get gas when you need it most.

Some letters are found on the city map more often than others, for example school, theater, and restaurant. Remember, the farther ones will return you more money. You get more for north-south movement than for east-west.

Finally, you can drop off your money on hand at the depot anytime. Your final score is the cash you have cached at the depot, not the amount you are carrying.

In the VIC version there are four levels of difficulty: 1, the easiest, to 4, the hardest. At level 1, one trolley car moves for every move your cab makes. At level 4, all four trolley cars move for every move your cab makes. It's best to start at level one before trying higher levels.

Adjusting For VIC Memory

Program 1 was written for the VIC with 3K memory expansion. If you only have an expander that provides 8K or more of additional memory, you must delete line 5 from Program 1. Then, each time you load Cabby you must first enter the following lines:

```
POKE 43,1:POKE 44,32:POKE 8192,0:NEW
POKE36869,240:POKE 36866,150:POKE 648,30:
  PRINT "{CLR}"
```

Tracing The Program (VIC Version)

Line 5 protects memory for special characters: multicolored cabs, depot, traffic lights, the street man, and trolley cars. These are protected by lowering the top of BASIC memory in the 3K expanded VIC to 7168 instead of 7679.

Lines 10 and 20 alert the user that special graphics are being generated.

Line 50 copies the first 64 characters from the ROM character set at 32768 down to RAM.

Line 55 copies the special characters, 13 in all, into locations in protected memory.

Line 60 sets the joystick variables.

Line 65 dimensions the array variables.

Line 66 reads place names into the string variable F$(I).

Line 150 initializes screen variables.

Line 160 defines two major functions used frequently throughout the program.

FNA(X)=INT(RND(1)*X)+1 gets a random number from the 1 to X by simply using FNA(X), where X is the highest number we want a chance to generate. For example. X=FNA(20) makes X a random number from 1 to 20. This saves memory if you are doing lots of random number generation. The second function is FNL(Q)=H+22*Y+X, which lets you plot anything on the screen at a particular spot by giving the X and Y coordinates of the spot you want. Both X and Y must be set before the function is called. In this case, Q is a dummy variable, and its value is not important. It is required by the syntax of the DEFine function statement. Y is the line or row number from 0 to 22. X is the column or character position from 0 to 21. For example, if we found the following line in our program

```
X=10:Y=10:POKE FNL(Q),0
```

the computer would put the street man character zero 10 lines down and 10 columns across on our screen.

Line 170 initializes the traffic lights.

Lines 180–190 determine the level of difficulty.

Line 195 changes the character register to point to the protected RAM area rather than the ROM area 32768.

Line 200 calls the subroutine to draw the city map.

Lines 210 & 220 initialize a few more variables.

Lines 300–390 control the program.

The main program is set up as a series of subroutine calls. This makes adding new ideas much easier. All you have to do is write the subroutine and then add the calling line to the main loop.

The subroutines called by the main loop are as follows:

Lines	Subroutine
500–630	joystick and cabby movement
1000–1020	traffic lights
2000–2020	dispatcher call to cabby
3000–3300	draw city map
4000–4700	passenger pick up or drop off
5000–5240	trolley car control
6000–6095	game over (crunched by a trolley car)
7000–7040	draw street man
8000–8040	depot (deposit money)
9000–9150	fill up at gas pump
9600–9660	gas gauge readout routine if fire button pushed
9700–9770	out of gas routine

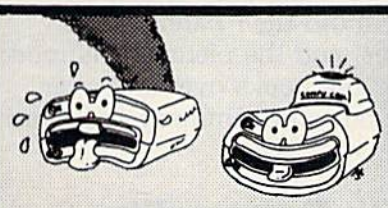
See program listings on page 153.

The 64 Version

The Commodore 64 version of "Cabby" has different trolley movements, and only two difficulty levels. In this version, the trolleys run on predetermined routes. If your cabby happens to be on the same route as one of the trolleys, that trolley will chase the cab until it hits it, or reaches the end of its route.

Difficulty levels, in the 64 version are based on the number of destinations available to the cabby. For instance, in both versions, the computer prompts you to go to a specified location—say a school. In the easy level, there are several different schools on the screen. In the hard level, the computer randomly picks one particular school as your destination.

To move the cab, use a joystick in port 2. You can move the cab in four directions—left, right, up, and down. Diagonal movement is allowed only to enter a destination, or to pick up the street man. He can get into your cab only when there is no destination message flashing on the screen.



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A Journey Through The Land Of The Buddy-Bots

Fred D'Ignazio, Associate Editor

Software Fairy Tales

Software developers looking for new approaches to early-learning software could spend a profitable afternoon visiting and browsing through a good children's bookstore.

If they wander through a bookstore, they'll notice that most paper-and-print materials for young children are centered on *stories*. Even the youngest children are fascinated by stories about other children, animals, and creatures—both realistic stories and make-believe stories. Often these stories carry significant educational messages, but the messages are artistically hidden within a strong plot, and expressed through the medium of lovable, realistic characters.

I'd like to see more programs designed along these same lines. We've had enough programs for young children with weak, poorly developed story lines and insipid characters. What we need now are *software fairy tales*—stories and characters that "come alive" when the child turns on the computer.

Not For Children Only

Most families with little children have at least a small collection of children's books. And some of those books are well-worn, well-read, and special.

When my children, Catie and Eric, were younger, they had several favorite books and several favorite authors (and illustrators). Among their favorites were Judith Viorst (*Alexander and the Terrible, Horrible, No Good, Very Bad Day*), H. A. Rey (*Curious George*), Ludwig Bemelmans (*Madeline*), Maurice Sendak (*Where the Wild Things Are* and *In the Night Kitchen*), and Mercer Mayer (*One Monster After Another* and *There's a Nightmare in My Closet*).

My children weren't the only ones who loved these books. So did their parents. The characters, the stories, and the pictures charmed all of us. So we read the books over and over again—as much for our entertainment as for our children's.

Programs With Personality

The most important ingredient missing from most early-learning software now on the market is *personality*. There are no interesting characters for children and parents *to care about*. The world in which the software action takes place is usually so artificial and sketchy that we have no desire to go back to it. And the story line is usually nonexistent.

This is why when I saw an announcement for a new line of software by Mercer Mayer, one of my family's favorite authors, I got very excited. Perhaps Mayer's programs would have strong characters, stories, and personality, just like his books.

On the other hand, I was worried that the programs might be as shallow as the other "celebrity" programs I had seen. Celebrities in sports, the movies, books, and records have been making software for the last year and a half, lending their famous names to rather mediocre programs. I was afraid Mercer Mayer's software might not be as wonderful as his books.

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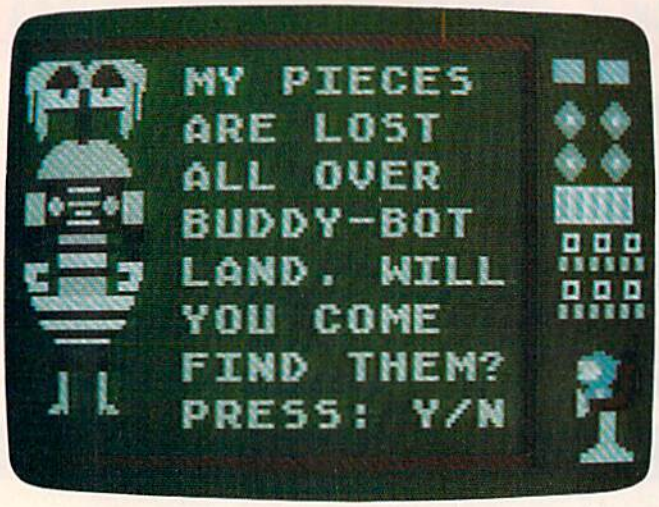

Tonk And The Buddy-Bots

Mercer Mayer's first program, *Tonk in the Land of the Buddy-Bots* ($39.95 for the Commodore 64), is part of a future line of eight Sprout programs for children ages 4 to 12. Mayer's software development company, Angelsoft, is publishing the programs through Mindscape. For more information contact:

Mindscape, Inc.
3444 Dundee Road
Northbrook, Il 60062
(312) 480-7667

Solid Packaging

When I got *Tonk in the Land of the Buddy-Bots* in the mail, the first thing I noticed was the unusually nice packaging.

The program materials come inside a red hard-plastic case the size of a trade paperback book. Like a paperback, the case has a spine label so the software can be placed on a bookshelf—in a bookstore, a library, or home—along with other children's materials.

On the front side of the case is a nice cartoon featuring Tonk, with some of his Buddy-Bot friends in the background. Tonk and the Buddy-Bots are honestly portrayed on the cover and elsewhere in block-graphics form, instead of as smoothly drawn cartoon characters. This representation does not detract from their charm or humor.

On the back of the case are two screen photos of the program and lots of information about the contents of the package (handbook, warranty, disk), the machine requirements to make the software work (Commodore 64, disk drive, color monitor or TV, joystick optional), the age group the software is targeted for (ages 4 to 8), and the educational benefits. (Among other things the programs help children improve their concentration, their memory, and their visual discrimination skills.)

A Journey Inside The Computer

The manual to *Tonk in the Land of the Buddy-Bots* is excellent. It is short, clear, and full of cartoons and screen photos. And it begins by leaping right into the story:

> **Meet the TinkTonks!**
> *Imagine that you have become a beam of light and are magically swept along inside your computer. Below you is a deep blue sea crisscrossed by a glowing grid. Above you is a peach-colored sky. On the Horizon, little disk-shaped islands float in the air above the CrissCross Sea. You fly down for a closer look. On the islands are mountains and valleys, lakes and rivers, forests and fields. One island even has a little town with houses and streets. You have found TinkTonk Land, the home of the TinkTonks.*

The reader is introduced to the TinkTonks, including their trusty leader Tink; Zoomer, the speediest TinkTonk; Boomer, the biggest TinkTonk; Teep and Beep, the little twin TinkTonks; and Tinka, the best Tonkerball player in the land. In addition, the reader meets Tonk, who is Tink's best friend, and the TinkTonk who usually gets in the most trouble.

When the program begins, the first thing we see is Tonk and four Buddy-Bots on the screen dancing. The Buddy-Bots are hilarious. There is a dancing creature with rotating eyeballs, a wheeled "bot" with crossed eyes and shimmy arms, and a jogging creature with bug eyes.

The music makes the dancing, gyrating creatures seem part of a musical play. The creatures, Tonk, and the music whet your appetite for more story and more adventure.

The next thing you see is a simple menu. If you press 1, you go directly into an adventure. If you press 2, you get to play Buddy-Bot games.

My advice is to go on the adventure. The games are good, but the charm of this program is in having your child play the part of Tonk and helping out the Buddy-Bots. The games are much more effective when they are played as challenges faced during the course of the adventure.

Find The Buddy-Bot Parts

When you and your children choose "Adventure" on the menu, Tonk and a Buddy-Bot appear on the screen along with this message:

"Emergency! Emergency! Trouble in Buddy-Bot Land! A Buddy-Bot's parts are scattered everywhere. The Buddy-Bot needs Tonk to collect his parts and put him back together again."

If the child presses Y at this point, he'll look for scattered parts of the Buddy-Bot shown on

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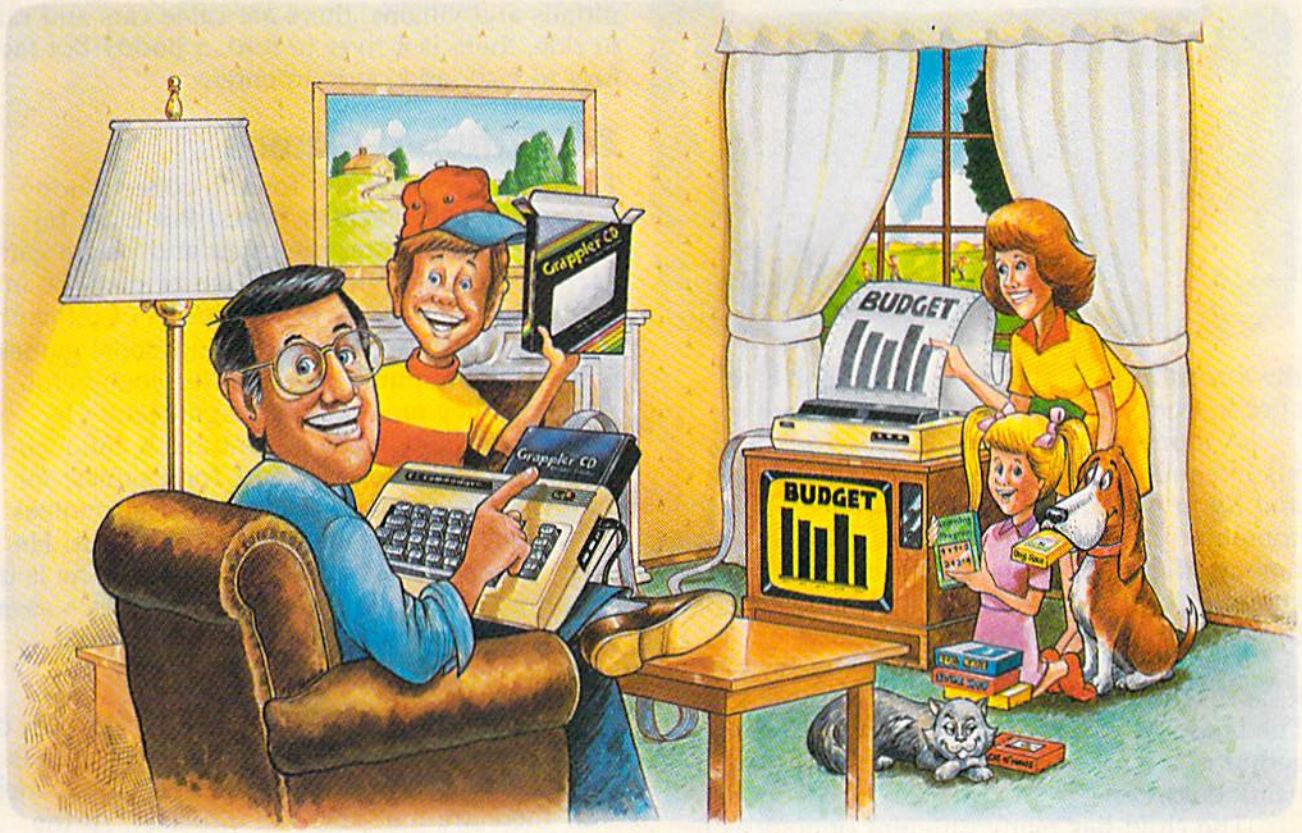

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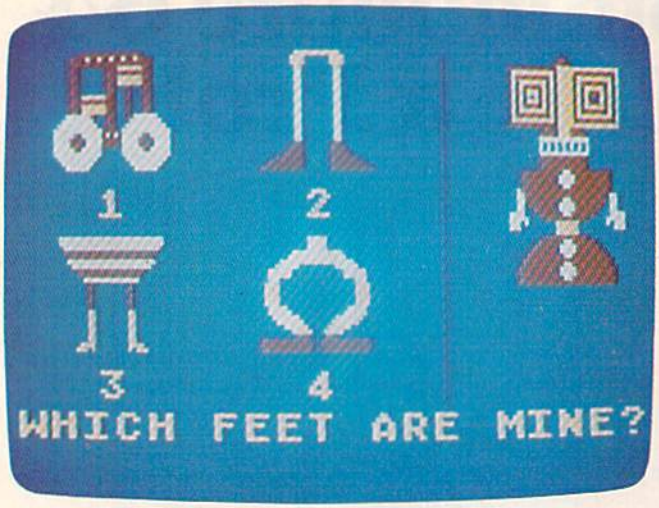

the screen. If the child presses N, he gets to choose from 128 different Buddy-Bots.

A moment later the child sees Tonk leave his treehouse, climb into a little flying saucer, and fly to the land of the Buddy-Bots. Then the computer transfers control to the child. From now until the end of the adventure, the child controls Tonk and guides him on his quest for the missing Buddy-Bot parts.

The child uses the joystick or the keys I, J, K, and M to move Tonk around Buddy-Bot Land. The land is divided into 65 screens (pictured together in a map on pages 12 and 13 of the handbook).

The child has many different options as he explores Buddy-Bot Land. If he is tired of his adventure, he can press the RUN/STOP key to stop an adventure or the f1 key to go back to the main menu. He can call up a HELP screen to review the rules. He can press the B key, and the computer will show him the Buddy-Bot parts he has found and what they look like when they are assembled into a complete Buddy-Bot.

Watch Out For The Great Gork!

No story is complete without danger and villains. The stories that appeal most to small children are miniature morality plays pitting the forces of evil against the forces of good.

In a computer game the "good guys" should be under a child's direct control. In Mercer Mayer's first adventure, there is only one good guy—Tonk. But there are plenty of bad guys and dangers, including the Great Gork, Gork's Soldiers, Black Holes, and Sky Holes.

If the child bumps into Gork, he is sent away from Buddy-Bot Land. If the child meets the soldiers, they will steal one of his Buddy-Bot parts and capture him and send him to Gork's castle.

If a child falls through a Black Hole, he lands inside Gork's castle. If he falls into a Sky Hole, he is carried back to his treehouse. He loses all his Buddy-Bot parts and must start the adventure all over again.

Buddy-Bot Land is complex enough to be interesting, varied, and challenging. Along with the pitfalls and villains, there are cable cars and rafts to ride, there is a river to ford, a Buddy-Bot factory to visit, and caves to enter.

Educational Games

There are two ways for Tonk to collect Buddy-Bot parts. He can search Buddy-Bot Land for parts, or he can enter the caves and play a game. A child can go on the adventure or play the individual games at any of four levels of difficulty.

The games are standard educational games you see in computer programs for young children, but they are enhanced significantly by being embedded in the adventure. A child can play them with the story and Tonk's quest for Buddy-Bot parts as a backdrop that galvanizes his imagination and engages his emotions. He isn't just matching shapes in the games, he is trying to rescue a Buddy-Bot. This provides a strong incentive to concentrate, learn, and do well.

There are six games:

1. *Different/Alike*—The child has to pick the minibot (Buddy-Bot) on the screen that is different from the rest. As in all the games, there are four levels of difficulty. At the highest level, the child has to pick out the two minibots that are *exactly* alike.

2. *Match the Shadow*—The child moves a large cross-shaped cursor around on the screen until it falls on the shadow of the minibot pictured on the lefthand side of the screen. There are six minibot shadows to choose from in the easiest level, and ten shadows in the hardest level.

3. *Minibot Shuffle*—This is my favorite. It resembles the old "shell" game in which someone hides a pea inside a walnut shell, then shuffles the shells around on a table trying to confuse you so you don't know which shell hides the pea. In Minibot Shuffle, the shell is replaced by a colored box, and the pea is replaced by a minibot. The speed of the shuffling minibot boxes increases along with the level of difficulty. This is a challenging, fun, and different kind of computer game. And it is an excellent device for strengthening a child's sequencing ability, eye-tracking ability, and understanding of spatial relationships.

4. *Remember Me*—This is another nice game. First the child sees a minibot on the screen. Then the minibot disappears, and the child

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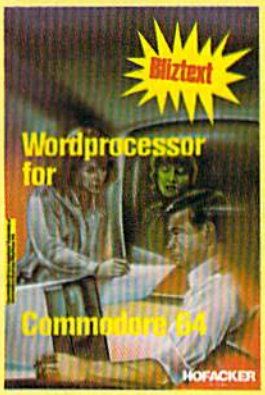

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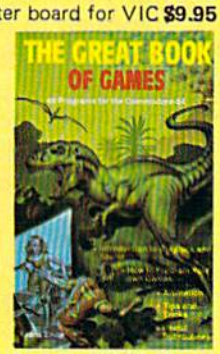

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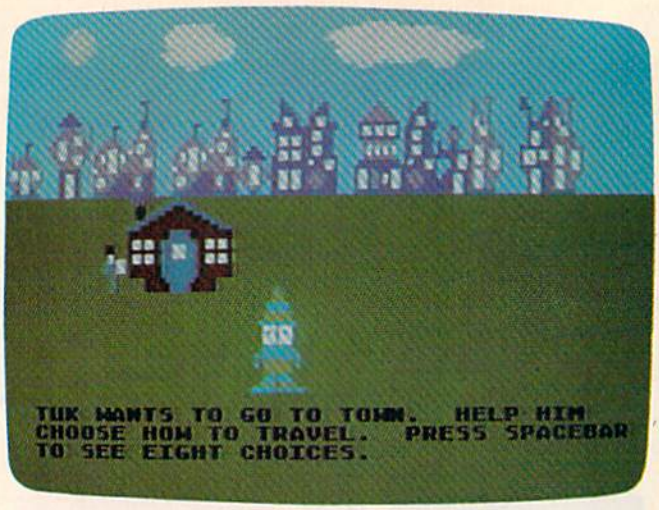


has to reassemble it from an assortment of body parts. The task is divided into three steps related to parts of the body. The child has four heads to choose from, then four trunks, followed by four sets of legs and feet. At the highest level, a child has only two seconds to look at the assembled minibot at the beginning of the game before it disappears.

5. *Buddy-Bot Puzzle*—This time the pieces of the Buddy-Bot and the entire, assembled Buddy-Bot are on the screen at the same time. On the right side of the screen is a puzzle box where the child assembles the Buddy-Bot. A flashing cursor points to one of 12 sections inside the box that corresponds to one of 12 puzzle pieces on the center of the screen. At the highest level, the cursor jumps randomly around the puzzle box, the Buddy-Bot parts are randomly arranged (from A to L), and when a child makes a choice, he cannot change his mind.

6. *Minibot Factory*—After the other challenging games, this game is a relief. It's just for fun. The child pilots Tonk inside a Minibot Factory and watches minibot parts roll by across the top of the screen on a conveyor belt. A large, hollow, block-shaped cursor frames the parts momentarily as they roll by. The child selects a part when he presses the space bar. The fun of this game is to make silly Buddy-Bots—with heads underneath legs underneath bodies; or with three heads, or three bodies, or three sets of legs. Once the child has built the minibot, the computer animates it, and the jaws open and close, the eyes rotate, the arms wave, and the legs jump up and down.

What Eric Thought

After I previewed *Tonk in the Land of the Buddy-Bots*, I found my five-year-old son Eric, and we played together.

Eric liked the adventure and the games as much as I did. Together we had only one serious criticism: the way right and wrong answers were handled.

For example, in playing *Same or Different*, when Eric picked the wrong minibot, the computer responded with: YOU'RE WRONG!

This answer was a real shocker. Most early-learning software developers these days adhere to the philosophy that software for little children should not be judgmental, or that, at least, the judgments should be gentle. This is not gentle. Eric and I thought that software that yells at us (with exclamation points) is very unfriendly and not very nice.

We also had other problems with the messages. For example, they were not accompanied by any sound. This seemed to be a great oversight—both in terms of entertainment and educational value. The Commodore 64 has such good sound (used so well in other parts of the program) that it's a shame when it's missing. The contrast with the other parts of the game in which sound accompanies the action was very noticeable and unpleasant.

Finally, after Eric and I got zero out of six answers correct on one game, the Great Gork appeared on the screen to tell us that we didn't get all the answers right, and to try again. Later, after we got four out of five answers correct on another game, Gork reappeared with the same message.

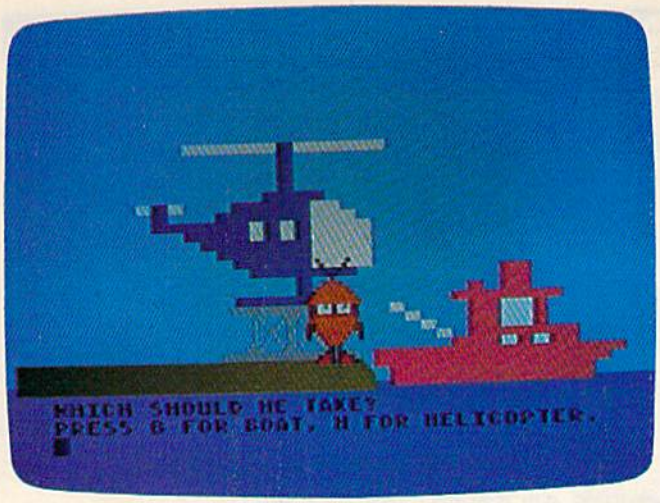
I found this a great let-down. When we got all the answers wrong, we thought Gork was being nice to us, but when we got almost all the answers correct, we were proud of our efforts. We expected Gork to come on the screen and congratulate us. Instead he told us we weren't perfect ("You did not get all answers right."), and he ignored our achievement.

Later, when we were playing the *Remember Me* game, we had a similar experience. We remembered two out of three of the minibot parts, but the minibot still told us, "You forgot me!" I would have preferred to have had the minibot congratulate us for remembering two out of three parts, and then call our attention to the part we missed.

Encore!

These are serious grievances, but they are still minor compared to the pleasure Eric and I had playing with the programs.

The games are innovative, and Tonk and the minibots are delightful. There are lots of nice little touches, too, which show careful design.



For example, when Tonk bumps into a wall, he falls back, gently, on his bottom.

Mercer Mayer's first "software fairy tales" are not as good as his books, but they are still superior to most of the programs now on the market for young children.

Eric and I hope that in future programs the computer's responses to our answers will be improved, and we hope to go on new adventures with Tonk and the other TinkTonks really soon.

Run, Tonk, Run!

Tonk in the Land of the Buddy-Bots allows your child to play using the I, J, K, and M keys on the keyboard or using a joystick.

Your natural tendency might be to have your child abandon the complicated keyboard in favor of the joystick. But you might want to reconsider.

First, joysticks are notoriously hard for small children to control. They are stiff and hard for little children to move. They are awkward for little children to hold in their small hands or in their laps. And young children frequently get the joystick turned upside down so that the joystick action is reversed from what the child expects (left is right and up is down). All in all, this adds up to a very frustrating experience for a small child.

Second, keyboards are not as frightening to small children as they are to adults. Also, children find that once they learn the direction keys on a program, they have more control over the motion of the computer character on the screen than they do with a joystick.

Teachers and parents can help small children recognize the I, J, K, and M keys on the keyboard by putting small colored dot stickers on each of the keys. For example, a red dot could go on I, a blue dot on M, a yellow dot on J, and a green dot on K. This helps children associate the dots with the letters and the respective directions.

If you plan to use a joystick anyway, you might consider one of the new Wico joysticks. After experimenting with several joysticks, my son Eric and I have decided that the Wico sticks are the easiest to control.

Wico Analog Joysticks have the softest touch and are the best for small children. Another good Wico joystick for the Commodore 64 is the Wico Command Control. You can learn more about these joysticks and others by going to your dealer or by contacting: Wico Corporation, Consumer Division, 6400 West Gross Point Road, Niles, IL 60648, (800-323-4014).

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Michael S. Tomczyk

BASIC Magic

Getting Comfortable With The PRINT Statement

We're pleased to welcome Michael S. Tomczyk and his new column, BASIC Magic, to COMPUTE!'s GAZETTE.

Michael's background includes four years at Commodore, where he served in key marketing, design, and publishing capacities. He was also co-author of the *VIC-20 User's Guide* and the VIC and 64 *Programmer's Reference Guides*. His column will focus on BASIC for beginners.

I'm happy to be writing a new column for COMPUTE!'s GAZETTE. I've always felt COMPUTE!'s magazines to be the best in the industry. BASIC Magic will be written for beginners, but I'll try to include a lot of information that will apply to most programming interests.

Our discussions will apply to the VIC-20 and Commodore 64, as well as the Plus/4 and the 16, expected out this fall.

We'll look at as many examples, tips, tricks, and secrets as we can pack into each column, so you'll have a lot of material to experiment with between columns. This month we'll start with a quick overview of the PRINT command. We're going to move fast, because we know you want to learn fast—but we'll proceed in very small steps so nobody gets lost. Your job is to study the lessons we cover, then experiment with the techniques and use them in your own BASIC programs. Are you with me? OK. Let's jump right in.

The Most Popular BASIC Command

The PRINT statement is the most popular BASIC command. It has more uses than any other command and you can have a lot of fun with it. In this lesson, we'll give you a very quick tour of the PRINT statement and see what it can do, then show you how to "mix and match" different types of PRINT commands in your own BASIC programs.

REM: *Before you begin, here's a helpful hint to save wear and tear on your fingers. You don't have to type out the whole word PRINT. You can abbreviate it by typing a question mark (?) instead. In other words, ?"MAGIC" is the same as PRINT"MAGIC". To use this shortcut, hold down the SHIFT key and type the key with the question mark on it.*

Displaying Information On The Screen

The PRINT command is mostly used to display or "print" information on the screen of your TV or monitor. You can do this directly just by typing the command like this (remember, you have to hold down the SHIFT key to type the quotation marks):

```
PRINT"MAGIC"
```

Now press the RETURN key, and you'll see that the computer PRINTed the word MAGIC. Try PRINTing your name. You can PRINT all the characters on your computer keyboard, including letters, numbers, graphic symbols, punctuation marks, blank spaces, and even sentences, like this:

```
PRINT"I LIKE BASIC PROGRAMMING."
```

PRINTing Graphic Symbols

When you look at your keyboard, you'll see that most of the keys have two graphics symbols on

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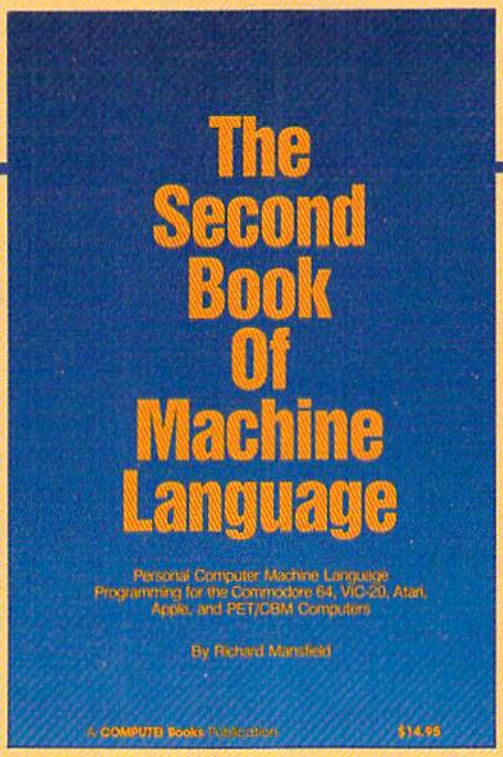
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the front, one on the left and one on the right. You can PRINT these symbols just like you would words or sentences. They're handy for making interesting designs, pictures, or even business charts.

Let's draw a horizontal line across the screen using the left graphics symbol on the T key, like this:

```
PRINT"————————————————————"
```

To make this line, hold down the Commodore key and press the T key 22 times if you have a VIC, or 40 times if you have a 64, Plus/4, or 16.

REM: *To type a left side graphics symbol, hold down the Commodore key and press the graphics key. To type a right side graphics symbol, hold down the SHIFT key while pressing the graphics key.*

Now try a right side graphics symbol, the heart (found on the S key). Remember to hold down the SHIFT key to type the heart.

CLEARing The Screen With The PRINT Command

Find the CLR/HOME key on your keyboard. When you hold down SHIFT and press this key, the screen is completely erased and the cursor moves to the top lefthand corner of the screen, which is called the *home position*. You can use the PRINT command in a program to clear the screen and home the cursor like this:

```
PRINT"{CLR}"
```

The CLR in braces indicates that you should hold down the SHIFT key and press CLR/HOME at the same time. A reverse heart will appear. This symbol represents the CLR/HOME command inside quotation marks.

You can put the CLR/HOME command inside quotation marks at the beginning of a message, like this:

```
PRINT"{CLR}YOUR MESSAGE HERE"
```

By including the CLR/HOME command in front of the message, you automatically erase the screen and your message appears at the top left corner of the screen.

PRINTing Editing Commands

The PRINT command is so versatile you can even print cursor movements. For example, if you want to tell the computer to clear the screen, move the cursor five spaces down, move the cursor five spaces to the right, then PRINT "HELLO", you can use a one-line command:

```
PRINT"{CLR}{5 RIGHT}{5 DOWN}HELLO"
```

The {5 RIGHT} means to press the cursor right key five times, and the {5 DOWN} means to press the cursor down key five times. Notice that pressing the cursor down key inside quotation marks makes a reverse Q appear. Cursor right is shown as a reverse bracket. Cursor up is shown as a reverse ball, and cursor left is a reverse vertical line. These reverse graphics (like the reverse heart for the CLR/HOME command) help you see where cursor controls and other editing commands appear inside your BASIC programs.

PRINTing Numbers, Values, And Calculations

Let's take a moment to look at how the computer tells the difference between a number which is PRINTed inside a message, and a numeric value which is used for calculation. If you include a number *inside* quotation marks, your computer treats that number just like a letter or graphics symbol, simply a displayed character. If the number is *outside* quotation marks, the computer treats the number as a *value* which can be used for calculation. Try these examples:

```
PRINT"5 PLUS 3 EQUALS 8"
```

In this example, the numbers have no value because they're printed as part of a message—*inside* quotation marks.

Numbers used as values are always PRINTed *outside* quotation marks like this:

```
PRINT 35
```

You can use the PRINT command to calculate the result of a mathematical operation, like the examples shown below. (When you press RETURN, the computer automatically displays the answer.)

Addition: `PRINT 2+2`
Subtraction: `PRINT 100-40`
Multiplication: `PRINT 5*4`
Division: `PRINT 288/12`
Combined: `PRINT (288/12)+(100-40)+(5*4)`

To combine a message with a mathematical operation you have to put the message *inside* quotation marks, and the calculation *outside* quotation marks. Notice in this example, even the dollar sign which goes with the answer is still part of the message because a dollar sign is not a number (value) and is not really part of the calculation.

```
PRINT"155.00 DIVIDED BY 2.4 EQUALS: $"
155/2.4
```

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one of the color keys to PRINT messages or graphics in that color. The Commodore 64 has 16 colors but only 8 are shown on the keyboard (the rest are obtained by using the Commodore key instead of CTRL). The new Commodore 16 and Plus/4 have 16 colors controlled by the CTRL and Commodore keys, with the added feature of *luminance*, which regulates the intensity.

To set a color inside a PRINT statement, hold down CTRL and press the appropriate color key—a reverse graphics character will appear—and everything after the color command will PRINT in that color until you change colors with a new color command. This short example prints 4 different colored balls (SHIFT-Q) on the screen:

```
PRINT"{BLK}Q{RED}Q{GRN}Q{PUR}Q"
```

The underline (as in Q) is the GAZETTE's way of showing that you should hold down the SHIFT key while typing the character. Notice that the computer stays set in the last color that was set—in this case, purple. If you want to go back to the standard color, or to another color after the command, add the color command you want at the end of the line. For example:

```
PRINT"{BLK}Q{RED}Q{GRN}Q{PUR}Q{BLU}"
```

will return the VIC to it's normal blue PRINT color. For the 64, replace the {BLU}—CTRL-7—with the proper key combination to get light blue, the 64's standard character color. That's done by pressing the Commodore key and 7 key simultaneously.

PRINTing Reverse Characters

You can PRINT any of the Commodore symbols in reverse by using the RVS ON and RVS OFF keys. (These keys are enabled by pressing the CTRL key first.) Here's a quick example:

```
PRINT"{RVS}NEGATIVE{OFF}POSITIVE"
```

PRINTing Variables

We'll cover variables much more thoroughly in a future column, but for now here's a quick introduction. A variable is like a code you can use to stand for something else. For example, let's say variable A stands for the value of the number 1, and variable B stands for the value of the number 2. Let's PRINT A+B and see what happens:

```
A=1:B=2:PRINTA+B
```

The computer displays the answer (3) because PRINT A+B is the same as PRINT 1+2, and we defined the variable A as 1 and the variable B as 2. Now, here's a real teaser for you. Can you figure out how this program works?

```
A=1:B=2:P$="PLUS":E$="EQUALS":PRINTA;P$;B
  ;E$;A+B
```

This is a more complex example, so let's look at the line closely. A and B are numeric variables used to stand for numbers 1 and 2. P$ and E$ ($ is pronounced "string") stand for the words PLUS and EQUALS. (String variables work like numeric variables—they represent something else. The dollar sign tells the computer that the variable is alphabetic, not numeric.) The PRINT command displays the numbers and words defined by the variables. A+B is a calculation, so the answer is PRINTed. The colons (:) allow you to put more than one command on one line (more on this later), and the semicolons (;) make the words and numbers print next to each other. Try it without the semicolons.

How BASIC Programs Work

So far, we've typed all of our examples directly into the computer—now we're going to see how we can use these commands in a BASIC program. Actually, any of the PRINT commands we used so far can be turned into a BASIC program simply by adding a line number.

The way to tell the computer that you're giving it a BASIC program is to type a line number first, then your command. A BASIC program can range from one line to several thousand lines. Here's an example of a one-line BASIC program using the PRINT statement:

```
10 PRINT"THIS IS A VERY BASIC PROGRAM."
```

When you press RETURN, your computer reads the line number (10) and realizes this is a BASIC program. Your computer then stores the program in its temporary memory and keeps it there until you tell it what to do next. From here you have several choices.

First, you can LIST the program by typing the word LIST and pressing the RETURN key. Try it.

After you LIST the program, you can correct or edit it by "cursoring" (moving the cursor with the cursor keys) to the place you want to change, and then use the INSERT/DELETE key (INST/DEL) to insert where you want to add information, or delete characters you want to eliminate. After editing, remember to press RETURN. Page 8 in your VIC user's manual and page 34 in the Commodore 64 manual show you how to edit BASIC programs.

Second, you can RUN the program. This tells the computer to perform all the commands or execute the program. Type RUN and press RETURN and the computer will follow the command and PRINT "THIS IS A VERY BASIC PROGRAM." If you've made a mistake, the computer displays an error message.

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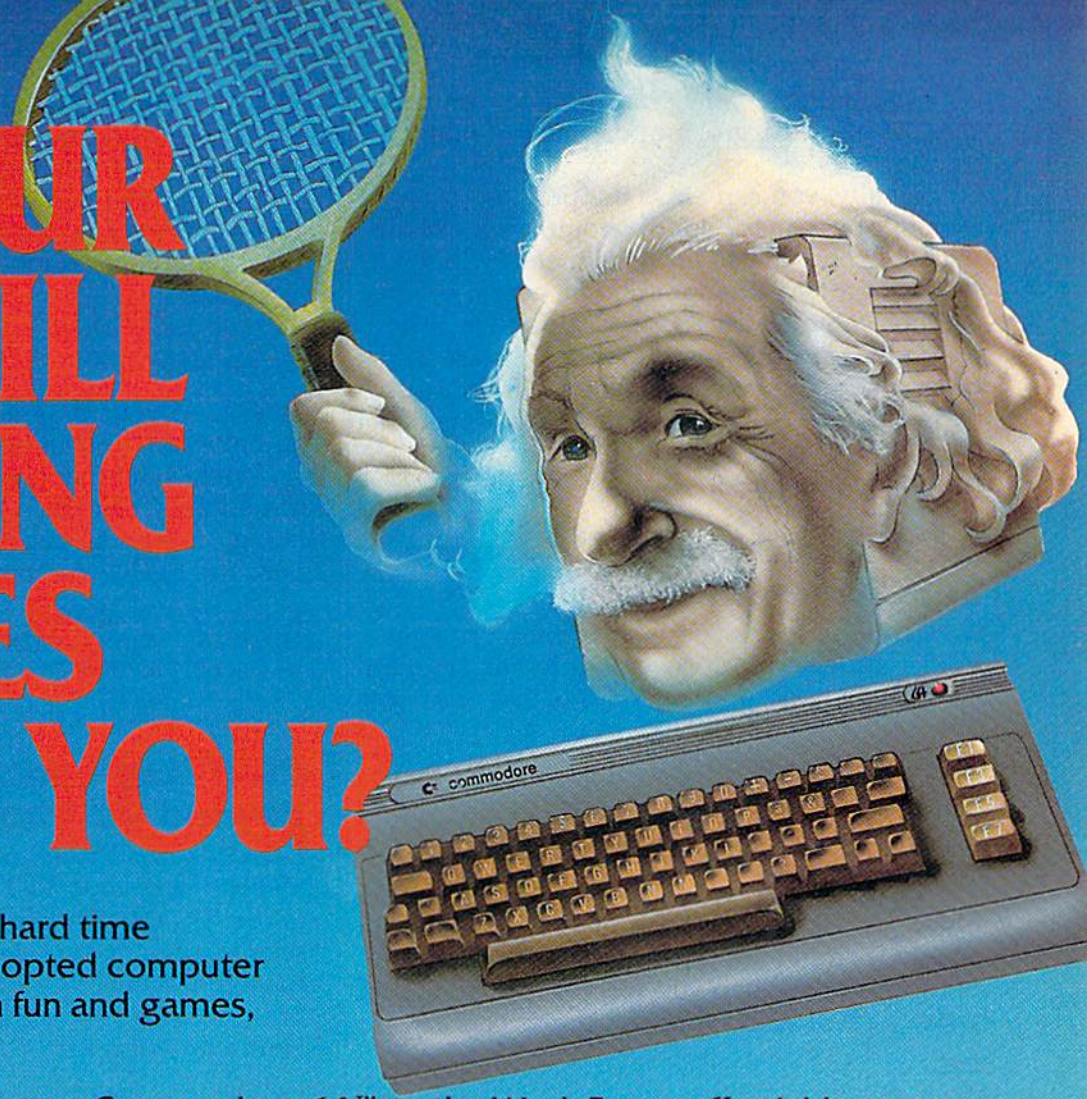

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You can also SAVE your program on tape or disk, or print the program on paper if you have a printer.

Finally, you can erase the program from memory by using the NEW command, which tells the computer to erase its memory to get ready for a new program. *But be careful* if you use this command because *everything* in your computer's memory will be lost. To erase the program you just entered, type the word NEW and press RETURN. The program is immediately gone. If you try to LIST the program, you'll see it isn't there any more.

BASIC Programs With More Than One Line

Now let's type a longer BASIC program with PRINT statements on several different program lines. Type NEW and press RETURN, then type this:

```
10 PRINT"{CLR}BASIC"
20 PRINT"IS"
30 PRINT"FUN!"
40 PRINT"{RED}SSSSSSS{BLU}"
```

The SHIFTed-S characters in line 40 should appear as heart shapes. For the 64, you'll need to change the final {BLU}—CTRL-7—to Commodore key-7. When you run this program, your computer will display this on the screen:

```
BASIC
IS
FUN
♥♥♥♥♥♥♥
```

Seems like a lot of typing to get this simple message, doesn't it? There's an easier way. You can put all these PRINT messages on one line if you separate each command with a colon (:). For example, our entire example can fit on one program line. To try this, type NEW and press RETURN, then enter this new line 10:

```
10 PRINT"{CLR}":PRINT"BASIC":PRINT"IS":PR
   INT"FUN!":PRINT"{RED}SSSSSSS{BLU}"
```

Type LIST and press RETURN, then type RUN and press RETURN to see the program in action. The result is the same as our first example, but only required one program line.

PRINTing Blank Rows

You can insert a blank row by using the PRINT command all by itself. Type NEW and press RETURN to erase any previous programs from your computer's memory, then enter this short program:

```
10 PRINT"{CLR}ONCE"
20 PRINT"UPON"
30 PRINT"A TIME"
```

Type the word RUN and press RETURN. The words are all on top of each other. We can add more space by inserting blank rows between the words, but you don't have to retype the program. Just type two new lines numbered 15 and 25 and they'll automatically be inserted in your program. Try this:

```
15 PRINT
25 PRINT
```

Now LIST your program and lines 15 and 25 are automatically included. Now RUN the program.

Here's another way you could have done the same thing. You could have put the PRINT command on lines 10 and 20 by adding a colon and then the PRINT command, like this:

```
10 PRINT"{CLR}ONCE":PRINT
20 PRINT"UPON":PRINT
30 PRINT"A TIME"
```

PRINTing Long Messages: Beyond 80 Characters

Each line of a BASIC program can contain up to 88 characters on a VIC and up to 80 characters on the 64, Plus/4, and 16. But what if your message is too long for one program line? You then have to use several PRINT messages on different lines, and tie them all together with semicolons. Here's an example:

```
10 PRINT"{CLR}";
20 PRINT"THIS MESSAGE IS LONGER THAN 80 C
   HARACTERS, SO WE HAVE TO CONTINUE";
30 PRINT"ON ANOTHER LINE, USING MORE THAN
    ONE PRINT STATEMENT AND PUTTING";
40 PRINT"SEMICOLONS AT THE END SO ALL THE
    PRINT LINES LOOK LIKE ONE LONG ";
50 PRINT"SENTENCE."
```

Notice how we begin each program line with a PRINT command, but continue the message uninterrupted in quotation marks. If there's a natural space between words at the end of a line, you have to include a space in your program, either at the end of the previous line or the beginning of the next line; otherwise the words run together. The semicolon at the end of each PRINT message program line is used like "programming glue" to make all the messages display right next to each other. Make sure the semicolon is *outside* the quotation marks.

We'll continue our discussion of the PRINT statement with some more advanced examples next month. In the meantime, as you learn more about BASIC you'll discover there are usually many different ways to program a BASIC action. As we continue, we'll try to show you some of these techniques so you can perform some BASIC magic.

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Quiz Master For The 64

George Miller, Assistant Technical Editor

This two-program package for disk users offers an effective and uncomplicated way to set up and administer multiple-choice quizzes. It's menu-driven for ease of use, and ideal for school or home study.

"Quiz Master" for the 64 is a package of two programs, "Quiz Generator" and "Student Quiz." Together, they can be used to create and administer quizzes. The first program allows parents or teachers to create multiple choice tests. The second program gives the test to the student. The only input required from the student is to type the answers for the quiz.

Menu Options

Quiz Generator begins with a display of the main menu: Enter New Questions, Review Questions, Change A Question, Load Previous Data, Add To Test In File, Initialize Disk, or End.

Type 1 to enter new questions and create a quiz. Each quiz can hold up to 100 questions. You'll then be asked if a file of quiz names exists. If this is the first time you've used the program, or if you're starting a new group of tests on a new disk, answer N. You'll then be asked to provide a name for your quiz. Type in the name, exactly as you want it to appear. The quiz name will be stored in a SEQuential file called TEST TITLES. Quiz Generator will accept up to 15 quiz files for each disk because of the screen formatting of the menu. (If you're covering more than one subject, you may want to have a separate disk for each one. For instance, a disk for history quizzes, another disk for math quizzes, and so on.)

Now follow the screen prompts to enter your quiz. You have full use of all screen editing functions, including the cursor control keys and the DELete/INSerT key. Be careful to make changes only where you intend to and don't move the cursor to areas where other text appears.

You shouldn't be concerned about word wraparound, the breaking of words at the end of the 40-column line. Just type each sentence using spaces where they normally occur, and standard punctuation, including commas and colons. Quiz Generator will look at your sentences and find the proper place to break each line. Each question can contain up to 80 characters, counting spaces.

Type in the four answer choices to the question, and give the correct letter choice when prompted.

To store the quiz, type the British pound symbol (£). The program will open a file with the quiz name you specified and store your information. A file to store the student's grades will also be created.

When you return to the menu, type 2 to review the questions. The screen formatting section of the program will now right-justify your questions, and the screen display will have each line ending with the last word that will fit on a 40-column line without breaking the word.

Follow the screen prompts to review each question. You'll be shown the questions, answer choices, and the letter of the correct answer to make sure that no typing errors were made when you entered the quiz. If you notice any mistakes, jot down the number of the question so you can change it later.

If you want to change any questions, enter 3, and answer the prompts from the computer. You'll have to enter the number of the question you want to change, so this is where you'll need the numbers you jotted down when you reviewed the quiz (option 2). The computer will display the question and answer choices, and then you may enter the correct question and answer choices.

Option 4, Load Previous Data, loads a quiz previously stored. You can then review this quiz.

Select option 5 if you want to add questions to a quiz already stored on your disk. You'll start entering questions at the first unused question number in the file.

The Initialize Disk routine, option 6, will format, or NEW, a disk, and give you several chances to abort the routine prior to formatting

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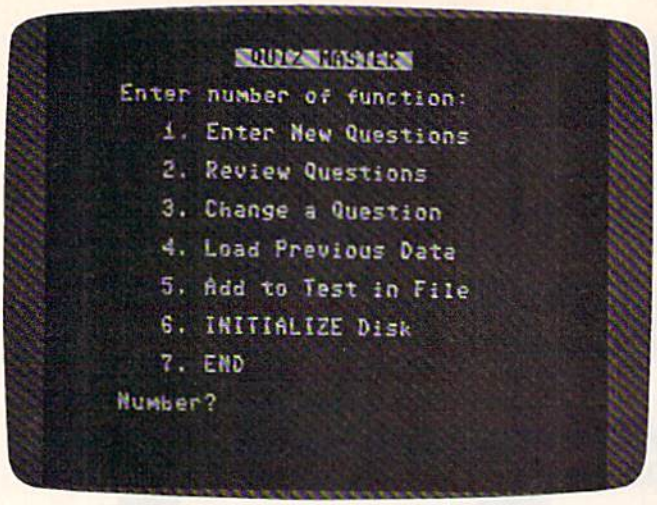

the disk. Make certain the disk in the drive is the one you want formatted, as all information on that disk will be destroyed by the routine. You can't enter this routine by accident, because you are actually taken out of the program before you can run the routine.

Abbreviations Required

Type in Quiz Generator and save it on a new disk. You'll be using Quiz Generator to generate sequential files, which can use up disk space rather quickly, so it's best to start with a fresh disk. You'll find that a few program lines extend beyond the 80-character limit of the 64, so it will be necessary to use keyword abbreviations. These can be found in Appendix D of the *User's Guide* or Appendix A of the *Programmer's Reference Guide.*

Some of the abbreviations you'll find most useful in entering Quiz Master are ? for PRINT, P SHIFT-R for PRINT# (?# is *not* correct), GO SHIFT-S for GOSUB, I SHIFT-N for INPUT#, P SHIFT-O for POKE, and P SHIFT-E for PEEK. To make entering and reading the text easier, hold down SHIFT and press the Commodore logo key to shift to upper- and lowercase text. You'll find this easier to read than the graphics characters the SHIFTed keys will normally print to the screen. You *must* use keyword abbreviations for lines 140, 790, and 1940 of Quiz Generator, and lines 40, 120, and 520 of Student Quiz. If it's necessary to edit these lines after entering and listing the lines, you'll have to reenter the entire line, with the keyword abbreviations.

Next, type in Student Quiz and save it. (Be sure to save this program before typing RUN as mistakes in typing will cause a return of a scrambled, tokenized BASIC listing.) If you plan to use Quiz Generator to give tests to groups of students, save Student Quiz on a second disk for use by the students. This will safeguard Quiz Generator from accidental erasure.

Student Quiz

When a student loads and runs Student Quiz, RUN/STOP–RESTORE and LIST are disabled, as are all cursor controls. The student can only answer the prompts from the computer. The student will be asked which quiz has been assigned, and that quiz will be loaded and run. With the checks built into the program, all the student can do is enter A, B, C, or D for answer choices.

If you want to guard Student Quiz from prying eyes, enter the following sequence of characters:

1, 0, R, E, M, ", ", DEL, RVS ON, SHIFT-M, SHIFT-S, Q, Q, Q, Q, Q, Q, Q, Q, Q, Q, RVS OFF, SPACE, SPACE, SPACE, SPACE, D, O, N, ',T , SPACE , D, O, SPACE, T, H, A, T, !, RVS ON, S, ", SHIFT-L

These keystrokes must be made in this order for the line to work correctly. Don't type the commas, just the indicated characters. Check your typing carefully before you press RETURN to enter the line; after you enter the line, you won't be able to edit it. (If you can LIST line 10, you've done something wrong.) DEL is the unSHIFTed position of the INST/DEL key at the upper right of the keyboard. RVS ON is CTRL-9, and RVS OFF is CTRL-0; these keys will not print any character on the screen, but all characters in between will appear in reverse video.

The strange combination of characters in this REM statement will cause any printing on the screen to be deleted, move the cursor down ten rows and over four spaces, and print DON'T DO THAT! on the screen. The listing will then end with a SYNTAX ERROR, leaving the cursor in the upper left corner of the screen.

This technique will also work on any other program you might like to protect. It's not foolproof, but it will prevent most students from listing the program. Of course, deleting line 10 will allow the program to be listed normally, as will listing from line 11 on (LIST 11).

A random number routine is used to scramble the order of the questions, so the quiz will be different each time. Quiz Generator also uses one question less than you have placed in memory. In effect, each student will be taking a different quiz, and each time anyone takes the same quiz it will be slightly different. The more questions you store in the file, the more variations Quiz Generator has to work with.

Since the random number generator searches for new numbers every time, it can take several minutes to generate a quiz, especially if you have many questions in the file. The screen will be blank during this process, and all keys will be disabled. Everything will return to normal when the quiz is ready.

See program listings on page 163.

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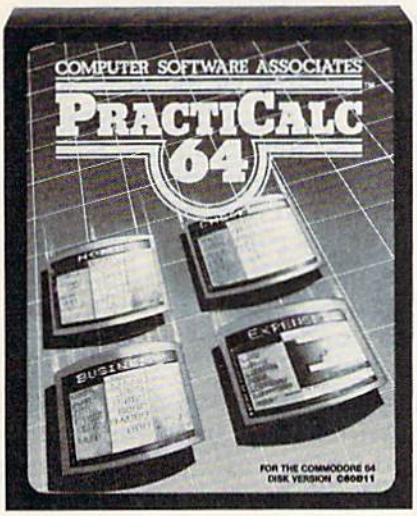

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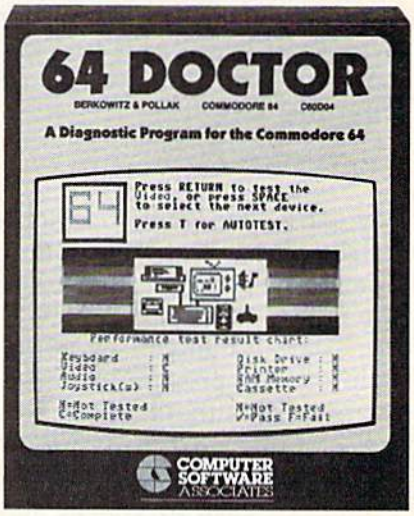
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Vocab Builder

William J. Treanor

This program not only helps increase vocabulary, but also assists students who must memorize words for spelling, biology, history, or other classes. Up to 100 words and definitions can be entered and saved to tape or disk. For the 64 and expanded (any amount) VIC.

My son's sixth grade teacher regularly distributes lists of words and their definitions to the students. The children then take a spelling test at the end of the week.

"Vocab Builder" was originally written to help my son prepare for these tests. But it was soon obvious that it could be used for other subjects—a history drill, say, with facts and dates in place of vocabulary words. Vocab Builder has even been used by college students learning medical terminology. The program flow is fairly straightforward; modifications (using a printer, for example) should be easy to make.

Four Menu Options

Enter the program, save it, and type RUN. First, you are asked to input your name, which is printed at the top of the screen.

Next, you'll see the main menu, which gives you four options: Enter new words, Study, Test, or End.

If you choose to enter new words, you are asked how many words will be in this particular file. You must then type in the words and their definitions. If you make a mistake, don't worry, you'll have a chance to correct it later. When all words and definitions are entered, they are printed on the screen. You can fix mistakes at this point.

The program then saves the word list as a sequential file on tape or disk. You are prompted for the date, which becomes part of the filename. (Note: Since the date is part of the filename, and the filename must be unique, be sure to use a different filename if you create a second quiz on the same day. For example, if you create a quiz named 11-21-84, use 11-21-84.1.) The program then returns to the main menu.

The second option from the menu allows you to study words which were previously entered. First, you enter the date of the test and the file is loaded from tape or disk (depending on your response, T or D, to the prompt).

The list is put into random order. A definition appears on the screen and the student is given three chances to enter the corresponding word. Spelling is important. If the word is correct, the student is congratulated. If the first two letters are correct but the word is misspelled, the message YOU'RE CLOSE appears.

When all words have been covered, the score (number of answers right and wrong) is displayed. Any word which was answered wrong on the first attempt is counted as incorrect. The student is then given a list of which words were incorrect and need further study.

The test option is similar to the studying option, but the student has only one chance to supply the correct word.

The final option, End, allows you to exit the program.

A Tireless Teacher

For young children, Vocab Builder may help develop a sense of responsibility. They can choose when to study and how long. They don't have to wait until a parent or sibling has some free time to help them with schoolwork.

The child is addressed by name, so it becomes his or her computer program. A computer doesn't tire of helping the child, or lose its patience. And it does not chastise the child for answering incorrectly. Words are randomized automatically (so the student actually has to learn the words rather than memorize them in order).

Memorizing can be a chore. Vocab Builder can help relieve some of the tedium.

See program listing on page 178.

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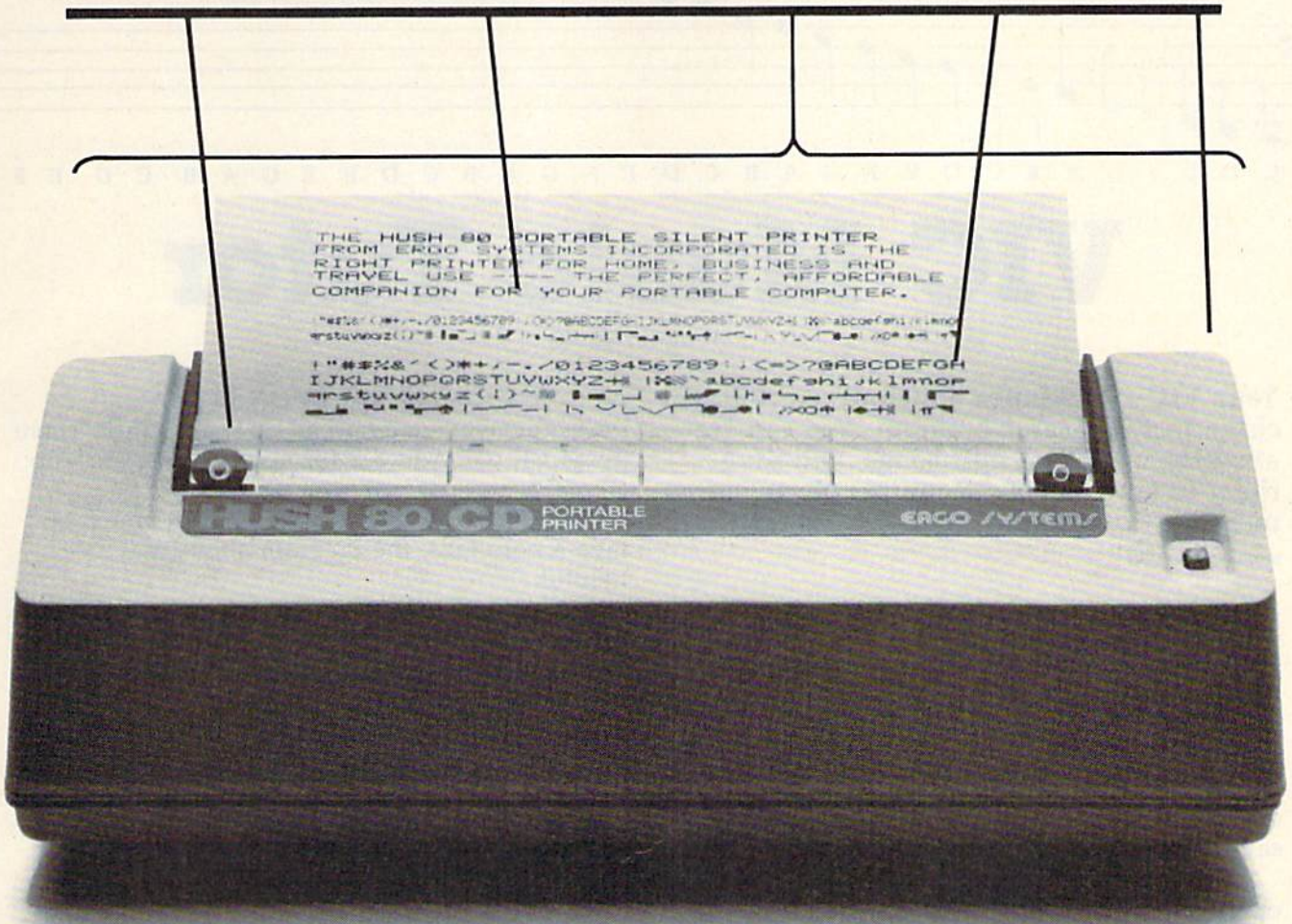

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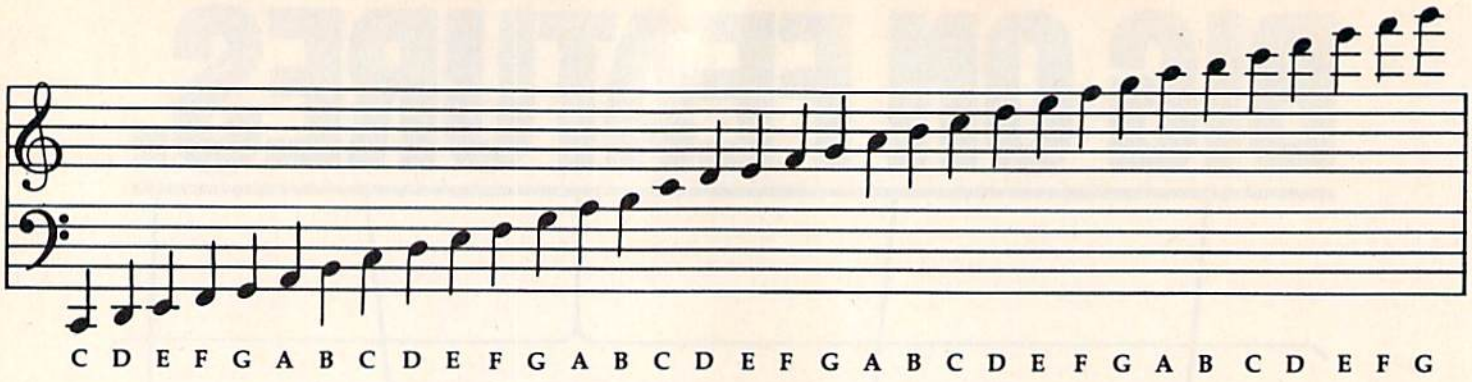
VIC Music Tutor

Howard Parnes

Your VIC-20 becomes a melody-editing machine in this useful program. You can create, play back, and edit songs, and save them to tape or disk. Requires 8K or more memory expansion.

This music aid for the VIC can help overcome certain problems faced by new musicians. It allows you to enter a tune from written music, or to compose your own, to play all or part of the music back at varying tempos, and to save it on tape or disk for later use. Insert at least 8K memory expansion, turn on your VIC, and enter and save the program.

After typing RUN, you encounter the first option in the program: to enter a new tune or load and play back an old one. Once you've entered and saved a tune, you can play back an old one, but the first time you use the program you'll be entering a new one. Give the song a number and type in the name. Then start entering the song note by note.

The Note Names

Each individual note in a music score provides two kinds of information: the pitch of the note, and its duration or time played. For simplicity, let's refer to the pitch as "note" and duration as "value."

First you enter the note. Since each of the three music voices on the VIC is limited to three octaves, we have a three-octave limit on the range of the notes we enter. Each octave starts with a C note. First determine which octave you want. If the note falls in the lowest octave, just enter the note itself—C or F or G, for example. If it is a sharp or flat, add either an S or F after the letter. An E-flat in the lowest octave would be entered as EF, an F sharp as FS, and so on. To move up to the next octave, add a 1 after the note. So a C-sharp one octave higher than the lowest octave is entered as CS1, an E one octave up as E1, etc. Add a 2 for notes two octaves up: C2, FS2, etc.

If you have difficulty figuring in which octave a note falls, the diagram above may be helpful.

Press RETURN after you've entered the data for the note. Now you enter the value for the note. Referring to "Time Values," you can readily see how to enter standard whole, half, quarter, eighth, sixteenth, and thirty-second notes. If you encounter a dotted note, simply add a D after the letter for the note value. For instance, HD is a dotted half note.

You may enter triplets and grace notes as well. Note in "Time Values" that there are divisions listed for each note—16 for the whole note, 8 for the half, etc. You may also enter note values in numerical form. Triplets, for instance, may take the form of three notes of equal duration played in the space of one quarter note. Thus each note in the triplet has a value of 1.33. Add the 3 triplets together and you get a value of 4—our quarter note value. Grace notes are played very quickly in front of a note of normal value. To place a grace note in front of a quarter note, for example, assign a short value to it like .2 and subtract it from the value of the quarter note. The grace note has a value of .2 and instead of entering a Q for the quarter note, enter 3.8.

To enter a rest simply enter R for the note followed by the value for the duration of the rest. After you enter each note and its value you will have a final check before the information is preserved in memory. The note and its value are displayed and you type either Y or N. Typing N lets you re-enter the note and value, while Y moves you on to the next note and value entry. To stop entering notes simply enter the English pound sign (£) instead of a note. This moves you to the next part of the program.

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VIDEO BASIC-64 DISK $59.95

This superb graphics and sound development package lets you write software for distribution without royalties. Has hires, multicolor, sprite and turtle graphics; audio commands for simple or complex music and sound effects; two sizes of hardcopy to most dot matrix printers; game features such as sprite collision detection, lightpen, game paddle; memory management for multiple graphics screens, screen copy, etc.

MASTER 64

This professional application development package adds 100 powerful commands to BASIC including fast ISAM indexed files; simplified yet sophisticated screen and printer management; programmer's aid; BASIC 4.0 commands; 22-digit arithmetic; machine language monitor. Runtime package for royalty-free distribution of your programs. Includes 150 pp. manual.

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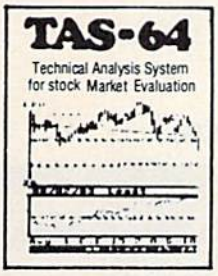

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How Does It Sound?

After typing the pound sign, you are asked if you want to hear the song. Type N and you skip to the editing phase. If you want to hear the song, type Y and select a tempo from 0 to 10. Most songs play best at a speed between 3 and 7 but you can slow them down or speed them up as you like. Next select the playback pitch, either 1 for low, 2 for medium, or 3 for high. There is an octave difference between each of these.

After you've made your selection, press RETURN again and the song will play. At the end of the song you have two options. Press RETURN again and the song will replay exactly as before. This is an important and useful feature we'll look at more closely later on. If you do not hit RETURN, pressing any other key takes you to the next option.

Here you are asked if you want to hear the song again. The first time you listen to your song you may select the tempo and pitch but you must listen to the entire song (or all you've entered up to that point). This time, however, you may choose to listen to only a part of the song. If you respond with a Y to "Do you want to hear it again?" you are then asked if you want to hear just part or the whole song. If you respond with "just part," you'll be told the total number of notes in the song and asked to select the starting and ending note of the part you want to hear. Then you may re-enter the tempo and pitch. Press RETURN and it will play according to your selected parameters. After it ends you'll return to the same series of options.

The choices may seem to be confusing and unnecessary at first, but they actually make the program flexible and easier to use. For example, most musicians, when learning a new piece of music, learn it in sections. They break the piece into smaller sections, practice these until they are smooth, then go on to the next section, until they've mastered the whole piece. "Music Tutor" is ideally suited for this. You can select any section to work on. You can then play the tune at a very slow tempo at first, and speed it up later. Sitting near the computer with your instrument you can listen to a section, then practice playing it. To hear the same section again at the same tempo, press RETURN once and it will repeat. As you get familiar with the section, speed up the tempo. Since values have already been assigned to all the variables from the previous playback, merely pressing RETURN for any option will leave that variable unchanged. If all you want to change is the tempo, simply press RETURN for the other options. But when the tempo selection comes up enter the new speed and then press RETURN.

Editing The Music

When you no longer want to hear the song, you then pass on to the next option. In this instance you can choose to single step through the song. Pressing f1 will play the notes one by one. When each note is played, the number, note, and value appear on the screen. If you want to change a note or its value, press f7. You then enter the replacement note and value and continue to single step through the tune. To add a note, press f2, enter the new note and value then continue to single step through the song. If at any time you want to stop the single step mode, press f5.

If you choose not to go into the single step mode, your next choice is whether to add more notes to the song. You are sent back to the record mode where once again you enter notes and values. These notes are added to the end of the tune already in memory.

In this manner you can enter a song piece-by-piece instead of all at once. Enter one section, then listen to it. Make any corrections via the single step process. You may then save this section. RUN the program again, load the song back, then add more notes. Check the song by listening again. Save it, and continue. This is an especially effective way to work when entering longer works.

The last option in the program asks if you want to save the tune. If you respond Yes, save to tape or disk. A negative response ends the program.

The program requires at least 8K expansion. It allows songs of up to 371 notes to be entered. With 16K expansion, you can have a maximum of 883 notes, and with 24K a whopping 1395 notes.

For those of you who would rather not type in the program, I'll make a copy (tape only) if you send a prepaid mailer, a cassette tape, and $3 to:

Howard Parnes
115 Chestnut Street
Frostburg, MD 21532

See program listing on page 176.

Time Values

VALUE OF NOTE	CODE	NO. OF DIVISIONS
Whole	W	16
Half	H	8
Quarter	Q	4
Eighth	E	2
Sixteenth	S	1
Thirty-second	T	.5
Whole Dotted	WD	24
Half Dotted	HD	12
Quarter Dotted	QD	6
Eighth Dotted	ED	3
Sixteenth Dotted	SD	1.5
Thirty-second Dotted	TD	.75

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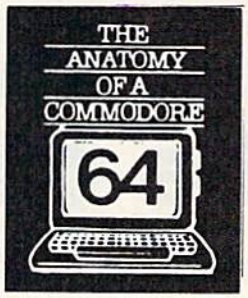

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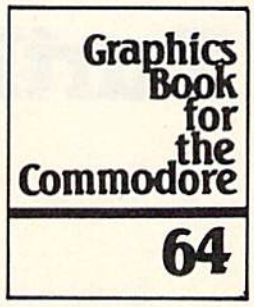

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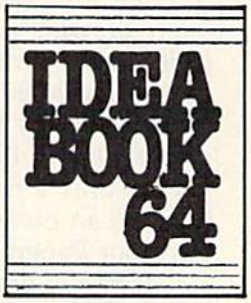

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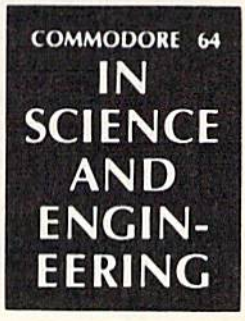

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Turtle Graphics Interpreter For The 64

Irwin Tillman

This comprehensive three-program package gives your 64 full turtle graphics capabilities. It's an excellent learning tool for children, and it offers a new graphics capacity for all ages. For disk or tape users.

Turtle geometry is fast becoming the first exposure to computers for many children. Instead of printing their names on the screen, they are more likely drawing squares and triangles. While such facilities are generally found with specific languages (such as PILOT and Logo), the concept of turtle geometry is not unique to any single language. One of the reasons for its popularity is that it's not only a natural introduction to computing, but also an excellent tool to teach thinking (see Seymour Papert's *Mindstorms*).

If you're not familiar with turtle graphics, the basic concept involves moving a turtle around the screen, leaving a trail as it goes. This is accomplished through a series of English commands, such as FORWARD and RIGHT. Other commands control the color scheme, define loops, and allow you to assemble a series of commands into procedures.

Coordinating The Turtle Programs

"Turtle Graphics Interpreter" consists of three programs designed originally for use with a disk drive; if you are using a tape drive, be sure to read the appropriate section elsewhere in this article.

The first program, "Interpreter," does most of the work. It accepts and executes the commands you enter. Program 2, "Turtle Data," POKEs in the shape tables for the turtle sprites and a number of machine language routines. Finally, "Turtle Boot" (Program 3) runs the whole thing.

It is very important that you type the DATA in Program 2 correctly; otherwise the machine language routines may crash the machine when the Interpreter is run. Also, you should leave out the CHR$(31) in line 140 of Program 3 until you're sure everything is working right. This will make the operation of the Boot program visible. When you are sure that the Boot is loading and running Turtle Data and Interpreter, reinsert the CHR$(31). Then, to run the whole package, just load and run the Boot program.

Turtle Commands

The Interpreter recognizes 30 commands, some of which can be abbreviated. In addition, the CLR/HOME key will clear the text portion of the screen and home the cursor (regardless of whether the SHIFT key is pressed). Pressing the f1 function key will change the border color; f3 handles the text-background color. In addition, trying to move from the text window into the hi-res screen will be treated as a CLR/HOME.

The commands are as follows:

FORWARD x (can be abbreviated as **FD**)—moves the turtle a distance of x in the direction it is pointing. The value of x must be greater than zero. The turtle will normally leave a trail as it moves (see PENUP, PENDOWN, PENDRAW, and PENERASE). You cannot leave the screen.

RIGHT x (RT), LEFT x (LT)—turns the turtle right (clockwise) or left (counterclockwise) x degrees (x is at least zero). Because there are only eight turtle sprites, the turtle will not always seem to be pointing in exactly the direction it should, but it will still draw and move properly.

SETHEADING x (SETH), PRINTHEADING—Setting the heading to x will turn the turtle without changing its position. Headings range from 0

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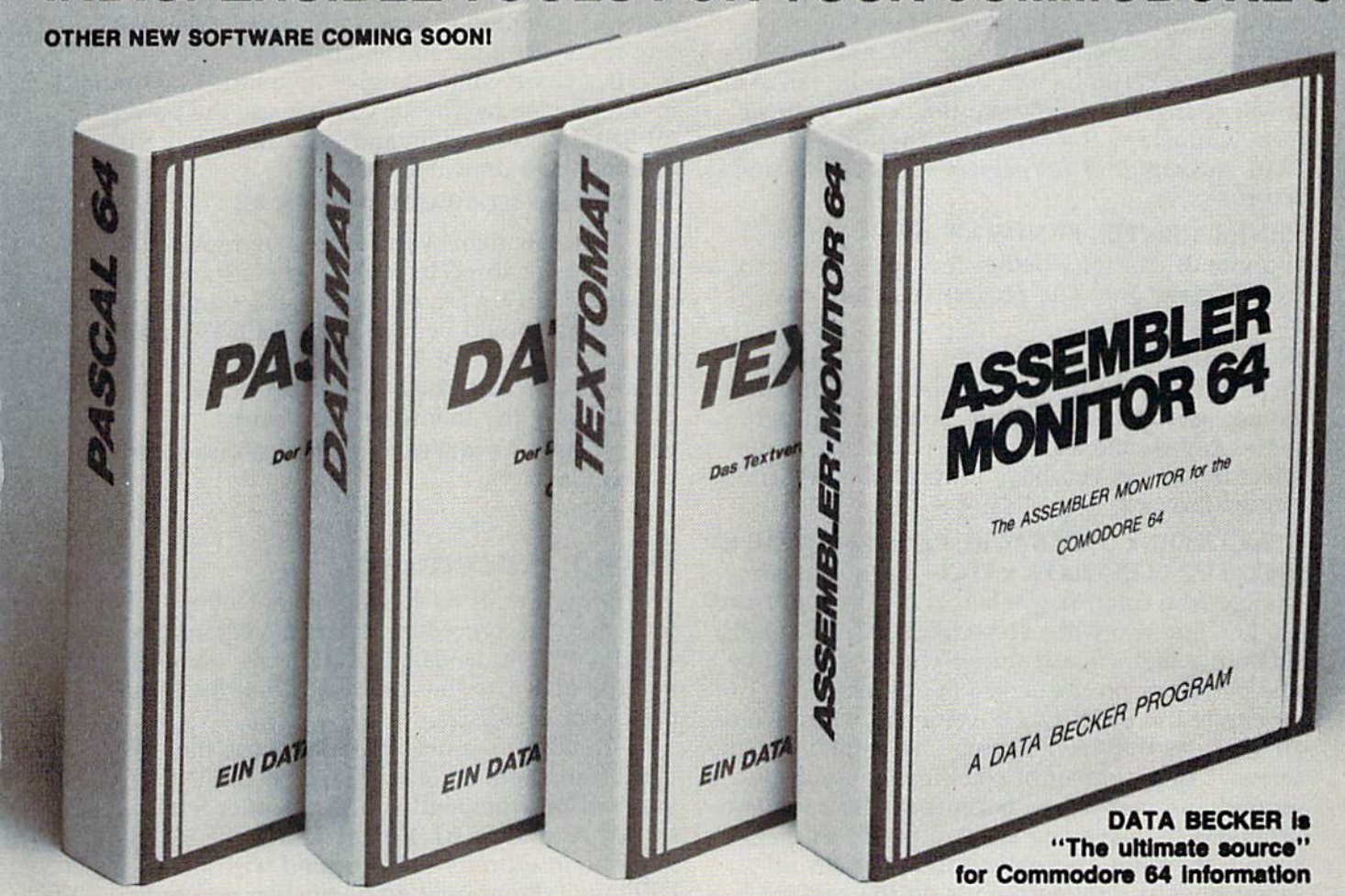

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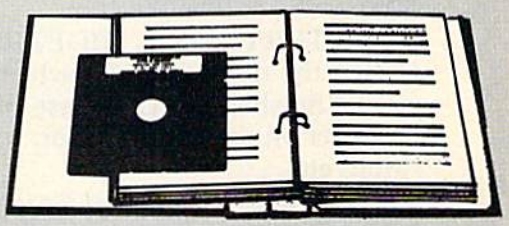

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to 360. Straight up is 0 degrees, and the values increase clockwise. PRINTHEADING returns the current value of the turtle's heading.

SETPOSITION x y (SETP), PRINTPOSITION—Setting the position to (x,y) moves the turtle without changing its heading. The value of x should be between −159 and 160, and y values range from −106 to 106. Note that the range of y will change if you change the "crunch factor" (see "Crunching the Screen"). The turtle starts at (0,0), the center of the screen. PRINTPOSITION returns (x,y).

PENERASE (PE), PENDRAW (PW)—These commands control whether the turtle will leave a trail or erase one. The program starts in draw mode.

PENDOWN (PD), PENUP (PU)—Normally the turtle's pen is down. Penup raises it so the turtle cannot leave or erase a trail. You may still set draw or erase modes, but you will not see any effect until after you have lowered the pen and moved forward.

PENCOLOR x (PC), BACKGROUNDCOLOR x (BC), TURTLECOLOR x (TC)—Each of these changes the color to x, where x is between 0 and 15. The first two will also perform a CLR/HOME. (It's not a bug, it's a feature.) There can only be one pen color on the screen at any time, so executing the PENCOLOR command will recolor all the lines that have already been drawn on the screen. Try a number of combinations of background and pen colors. Because of the hardware problems in displaying isolated pixels on the screen, the same pen color will appear as different hues at different points on the screen. Experiment—you may like the effect, which is known as "artifacting."

SHOWTURTLE (ST), HIDETURTLE (HT)—Hiding the turtle is useful when you want to view a finished design. These commands have no effect on the turtle's color, movement, position, etc.

HOME—moves the turtle to (0,0) and sets the heading to 0 degrees.

CLEAN—erases the hi-res screen. Note that pressing CLR/HOME will *not* disturb the hi-res drawings.

CLEARSCREEN (CS)—performs a CLEAN and HOME.

Combining Commands

The Interpreter will accept lines of up to 78 characters, and you may include numerous commands on each line—just be sure to use spaces between commands (no commas or colons). Here's a simple demonstration to animate the turtle:

```
FORWARD 100 RIGHT 90 FORWARD 100 RIGHT 90
FORWARD 100 RIGHT 90 FORWARD 100
```

These commands cause the turtle to draw a square. Because the Interpreter is in BASIC, the turtle won't move at breakneck speed. (If you are extremely ambitious, you could convert the plotting routine to machine language.)

If you are willing to give up a little more time in interpretive overhead, you can use the powerful REPEAT (RP) command. We can rewrite the commands to draw a square as:

```
REPEAT 4 [FORWARD 100 RIGHT 90]
```

The statements you want to be repeated should be enclosed in square brackets and preceded by REPEAT x, where x is the number of times they should be repeated. REPEATS may be nested to a depth of 255 (although procedure calls will decrease this, as detailed below). For example, try the following commands:

```
CS REPEAT 8 [REPEAT 4 [FORWARD 100 RIGHT
90] RIGHT 45]
```

Using Procedures

The full power of turtle graphics is realized with procedures. A procedure is like a program; it's just a series of commands given a specific name. That name is added to the commands that the interpreter will recognize.

To make up a new procedure, use the DEFINE command. For example, type DEFINE BOX. You will be prompted with BOX?, after which you should type REPEAT 4 [FORWARD 100 RIGHT 90]. The interpreter will respond with BOX DEFINED. From now on, whenever you type BOX (either from the keyboard or from within another procedure) the commands REPEAT 4 [FORWARD 100 RIGHT 90] will be executed. We could define the design above as 8BOXES: CS REPEAT 8 [BOX RIGHT 45].

Each time you call a procedure counts as a level of nesting (just as a repeat loop does). One very important warning: Don't allow a procedure to call itself (or to call *another* procedure that may eventually call the first). This will result in a loop that you will have to break by pressing the STOP key. When you restart the program by typing RUN, you will lose your procedure definitions and any designs on the screen.

There are a number of commands which facilitate working with procedures. NAMES will print the names of all the current procedures (limit of 255). PRINTPROCEDURE x (PPROC) will print the commands associated with the procedure named x. ERASE x will erase the procedure x, and RENAME x y will change the name of procedure x to y. ERASEALL will erase all the current procedure definitions.

Saving And Loading Procedures

Procedures may also be saved to and loaded from disk or tape. SAVE x will save *all* the current procedures (a "workspace") to a file named "x.turtle"; LOAD x will copy the procedures in "x.turtle" into memory. These will be *added* to those already defined, so you can merge workspaces. Files may be erased from the disk with SCRATCH x, which will erase "x.turtle." While these commands are operating, the screen will seem to go awry; ignore this as it will be restored when the operations are complete.

QUIT will exit the program, but leave the machine in an unusual state. The screen will still be split, but this may be corrected with RUN/STOP–RESTORE. Since memory is reconfigured, you'll want to return it to its normal state. If you don't want to power off and back on again, type

```
POKE 2048,0: POKE 44,8: NEW
```

Crunching The Screen

Because each brand of TV and computer monitor has a different vertical aspect ratio, you may notice that your squares aren't square, circles look like eggs, etc. If so, type

```
REPEAT 180 [FORWARD 2 RIGHT 2]
```

If your design isn't a circle, take a centimeter ruler and measure the diameter along the x and y axes. (These should be easy to identify; just slide the ruler along the screen until you get the maximum measurements in the horizontal and vertical directions.) Divide the x value by the y value. This is the "crunch factor." Change line 50 of Program 1 to set CR to this value. If you are using a Commodore color monitor, the value I've supplied in the program (.74) is appropriate. Note that changing this value changes the scaling on the y axis. The new limits will be ±79/CR.

For Tape Users

You can modify the package to use a tape drive with the following changes:

- Change the device numbers in lines 150 and 170 of Program 3 from 8 to 1.
- Change the word DISK to TAPE in line 80.
- Delete lines 7000–7100, 25000–25060, and line 1280 in Program 1.
- Change these lines in Program 1:

```
23010 GOSUB 5000:IF WD$<>""THEN23018
23014 ER=-1:PRINT"YOU MUST SUPPLY A NAME"
      :RETURN
23018 OPEN2,1,0,WD$+".TURTLE"
23060 CLOSE2:RETURN
24010 GOSUB 5000:IF WD$<>""THEN24018
24014 ER=-1:PRINT"YOU MUST SUPPLY A NAME"
      :RETURN
24018 OPEN2,1,1,WD$+".TURTLE"
24040 CLOSE2:RETURN
```

Program 3 should be saved first on the tape, followed by Program 2, and then Program 1. When Program 3 is loaded and run, it will then load and run the other two programs. For this autoload feature to work properly, you must save the programs with the names shown in lines 150 and 170—TURTLE GRAPHIC 2 for Program 2 and TURTLE GRAPHIC 1 for Program 1. Alternately, you could change the names in those lines to match the names under which you saved the programs.

There is one additional requirement for the autoload feature to operate properly. You *must* leave the PLAY button depressed after Program 3 finishes loading. If you release the button, the PRESS PLAY message will be printed to the screen when Program 2 is loaded, which will prevent the loading of Program 1.

How It Works

Short of rewriting the Interpreter in machine language, there are still a number of modifications you may wish to make to customize the program. I've included these details to briefly give you an idea of how the package functions.

Program 3 reconfigures memory to start loading programs at $4000, leaving $0800–$03FF free for turtle sprite data. Only the last 512 locations are used, so you could put additional sprites below them. The LOADs and RUNs are accomplished by printing the appropriate commands on the screen and filling the keyboard buffer with RETURNs.

Program 2 POKEs in the 512 bytes of sprite data below $0400, and then puts a number of machine language routines in memory beginning at $C000. The first routine is an interrupt-driven split screen routine. It also takes care of checking for f1, f2, CLR/HOME, and keeps text from scrolling onto the hi-res screen. This routine is initialed with SYS 49322. To clean the hi-res screen, use SYS 49295. SYS 49235 will clean under the hi-res screen (1024–1823) and erase the text screen (1824–2023). The hi-res bitmap is stored beginning at 8192.

Here are the important sections of the Interpreter (Program 1):

10–170: Initialization. Frequently used variables and constants are created first to improve speed. Here are most of the variables' functions:

PE	−1 = penup, 0 = pendown
DR	−1 = pendraw, 0 = penerase
C	conversion from degrees to radians
SC	screen base
BL	bytes per hi-res screen line
BB	bytes per hi-res screen block

MX	MSB of sprite x location
PX	LSB of sprite 0 x location
PY	sprite 0 y location
BG	used for sprite x seam
CR	screen crunch factor
MA	mask
BA	base in computer
C1-C7	constants used in determining sprite position
SP	sprite image number (0–7)
H	heading
CI	degrees in circle
XH, XL	x-hi, lo values
YH, YL	y-hi, lo values
IX, IY	initial x,y coordinates in FORWARD command
X,Y	current coordinates
SS	sprite spacing (45°)
HA	one-half
FF	used as a mask
PC	procedure counter
DH	delta heading
K, QQ, ZZ	temporary numeric storage
T$, ZZ$	temporary string storage
SE	sprite enable
PT	sprite 0 pointer
D	distance traveled
ER	−1 = error, 0 = ok
BY	byte to be POKEd
BI	bit to be POKEd
RO, CO	row, column for upper-left corner of sprite
XS, YS	coordinates for turtle sprite
WD$	current word
NU	numeric input value
PN	procedure number temp
MD$	disk read/write mode
NP	number of procedures in disk file

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200–620: The parser routine is the most complicated part of the program. NE keeps track of the nesting level. The command line typed at the keyboard is assigned to ST$(0). This serves as a permanent copy of the command line. ST(0) is an index into this string (how much has been processed). These are copied into IN$ and IN, which is what we actually work from. Commands are read off (and removed) from the left end of IN$ and executed in 1000–1300; IN and ST(0) are constantly updated.

Whenever a repeat command is found, the nesting level is incremented, the repetition factor is put in RP(NE), and the contents of the loop are put in a new command line, ST$(NE). The parser then executes ST$(NE) as already described. When we reach the end of a command line, we "pop" up by decrementing NE and continuing where we left off in the previous command line. Advanced programmers may recognize this as a stack used to simulate recursion.

Procedures are implemented in the same way. Whenever a procedure name is encountered, we drop down a nesting level, and treat the procedure's commands as the contents of a repeat loop with a repetition factor of 1.

1000–1300: Identifies and executes commands. If you choose to permanently change the name (or abbreviation) of a command, do it here. This section also clears the error flag to 0 (false) before each command. Any command that fails will set the error flag to −1 (true). The parser keeps track of the flag, and aborts all pending commands when the flag is set true. The individual commands all have good diagnostics, and you may assume that your commands have been successfully executed if no message to the contrary is printed.

2000–8000: These subroutines are used by the Interpreter in executing various commands.

9000–22000: Each of these subroutines corresponds to a single command; consulting the variable list should help clarify them.

Sample Designs

Here are some simple designs to get you started:

RECTANGLE: RP 2 [FD 80 RT 90 FD 30 RT 90]

HEXAGON: RP 6 [FD 100 RT 60]

PENTAGON: RP 5 [FD 100 LT 72]

PENTAGRAM: RP 5 [FD 161.8 LT 144]

TWOPENTAS: SETP −60 −80 SETH 90 PENTAGON LT 36 PENTAGRAM

ARROW: RECTANGLE LT 90 FD 15 LT 135 RP 2 [FD 42.4 LT 90] LT 45 FD 15 PE FD 28 PW

HONEYCOMB: SETP −30 30 SETH 330 RP 6 [RP 6 [FD 25 RT 60] RT 120 PU FD 25 LT 60 PD]

See program listings on page 167.

First Aid

Scott M. Huse

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Although the medical advice presented in this program is based upon sound, nationally recognized first aid training courses, the publisher and author must disclaim any and all liability in the use of this program for medical treatment.

To use this program, simply type it in and RUN. To select a specific category from the main menu, push the corresponding letter or number. Any key will return the user to the main menu. In order to customize the emergency phone numbers to your specific area, simply substitute your local numbers in lines 550–600.

See program listing on page 159.

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REVIEWS

Software Disk Alignment For The 1541

George Miller, Assistant Technical Editor

Sooner or later it happens: You try to load that exciting new software, but after your disk whirs and clatters for several minutes, you get a READ ERROR. That's not possible, you say. This is a brand new disk. Surely the disk must be defective. So it's back to the dealer, who successfully loads the program into his computer on the first try and then says, "Sorry, your disk drive must be out of alignment."

Can that be true? Of course not. Last night you formatted a disk and saved a program that loads and runs perfectly. But all that tells you is that your drive can read disks it has formatted itself. It reveals nothing about the alignment since those disks have been formatted with the tracks misaligned.

Head misalignment is a common problem with heavily used 1541 disk drives. Almost all of the dozen or so 1541 drives in daily use here at COMPUTE!'s offices have experienced the problem at some point in their service lives. Many of the drives seem to begin to experience head alignment problems six months to a year after being put into service (unfortunately, beyond the expiration date of Commodore's warranty).

The symptoms include the inability to load programs from commercial disks and frequent READ ERRORs when using disks formatted when the drive was comparatively new. Such errors are generally caused by the inability of the disk drive to access track 1 or track 35 of the disk.

Commodore 1541 alignment problems are often related to the fact that the drive's head is logic seeking. In other words, it looks for data on the disk and aligns itself to read the data. This is done by bumping a cam attached to a stepper motor against a fixed stop mounted on the frame of the drive; from there the drive searches for information to indicate that it has found track one.

Unfortunately, Commodore has used a pressure fitting method to secure the cam to the shaft of the stepper motor. Repeated bumping against the end stop will eventually begin to bump the drive out of alignment, and that's when your problem begins.

Misalignment can come about through ordinary use. In addition, commercial software using bad tracks and sectors for copy protection may contribute to an eventual alignment problem. Every attempt to read a bad track forces the cam to hit the end stop, eventually causing slippage of the cam. It should be noted that many normal functions of the DOS (Disk Operating System) can cause the end stop to be hit by the cam.

Until now, the only remedy was to visit a service center (if you could find one), wait until the service technician finds the time to squeeze you in, and then pay the going rate. The price could range from $40 to $85, and repairs could take two weeks to a month or more.

A Quick And Easy Fix

But with *1541 Disk Drive Alignment* from CSM Software, you can fix it yourself in an hour or so and the program will pay for itself the first time you use it. Besides allowing you to bring wayward drives up to specs, it also provides a ready reference to let you determine when your drive is beginning to slip before the problem becomes critical. In fact, if you wait too long to correct alignment problems, you might well find that the disks you wrote most recently are unreadable on your newly aligned drive.

Previously, most disk alignment procedures required at least a calibration disk, a dual trace oscilloscope, and precision alignment tools. This program, however, requires only a 64, a disk drive able to read the program disk, a screwdriver to disassemble the plastic disk drive

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I put auto-dial to work right away. I auto-dialed CompuServe, but couldn't get through, so I had VIP Terminal redial 'til it got through — it dialed five minutes straight! Then I auto-logged on with one of my 20 programmed keys, and downloaded some graphics screens, and stock quotes for dad. I printed it and saved it to disk as it came on the screen. Wow! And now I can send you my programs automatically. I got yours and they worked right off.

Those icons — you know, like the Apple Lisa — are a lot of fun. I also like the menus, function keys, highlights, help tables — great for a newcomer like me. And with the many options there isn't a computer I can't talk to.

What's really neat is that Softlaw has a whole VIP Library of interactive programs, including a word processor, spreadsheet and database, which will be out soon. Sis promised me the whole set for my birthday.

I see by the built-in "old clock" on the screen that long-distance rates are down. Got to call that L.A. BBS. Yep, there goes the alarm. Later.

- Lone

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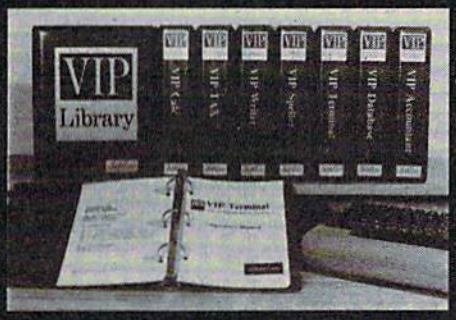

Virtual Memory

VIP Library programs are not limited by the size of your computer's memory. All programs use virtual memory techniques to allow creation and use of files larger than your computer's available work area. You're only limited by the space on your disk!

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case, a small screwdriver for an internal adjustment, and a feeler gauge to set the end stop.

In practice, after completing the other adjustments, the end stop is usually well within tolerance, and no further adjustments are necessary. No technical expertise is required to accomplish the alignment procedures, and the manual accompanying the program thoroughly describes the procedures.

To use the CSM program, simply load it into your 64 and follow the instructions in the manual. If your drive is very far out of alignment, the program may need to be loaded from a working drive, although it worked fine with each of the misaligned drives we tested it on at COMPUTE!.

The program includes checks for proper operating speed, a program to set the stepper motor correctly, and a test program for proper alignment, which allows you to adjust for the best possible alignment of your drive.

For disk drives that are badly worn and simply will not hold an alignment, the Fix is included. This is a method of securing the cam to the stepper motor shaft. It requires some additional tools, as well as a bit more technical and mechanical ability, but it may give your old drive new life. It certainly beats the price of a new one.

Included in the CSM package are *1541 Disk Drive Alignment*, *1541 Disk Drive Alignment Calibration*, and the instruction manual. Anyone with average mechanical ability, patience, and a little caution (you're working with an exposed circuit board and power supply plugged into a potentially dangerous 117 volts) can do his own alignment, or at least run a reliable test to judge the alignment.

The program is compatible with the 1541 and with the built-in disk drive on the SX-64. Due to the difference in speeds between the 1540 and the 1541 disk drives, the speed check and adjust program included with the program will not work properly on the faster 1540s. *1541 Disk Drive Alignment* should surely be part of every user's group library, and is a wise addi-

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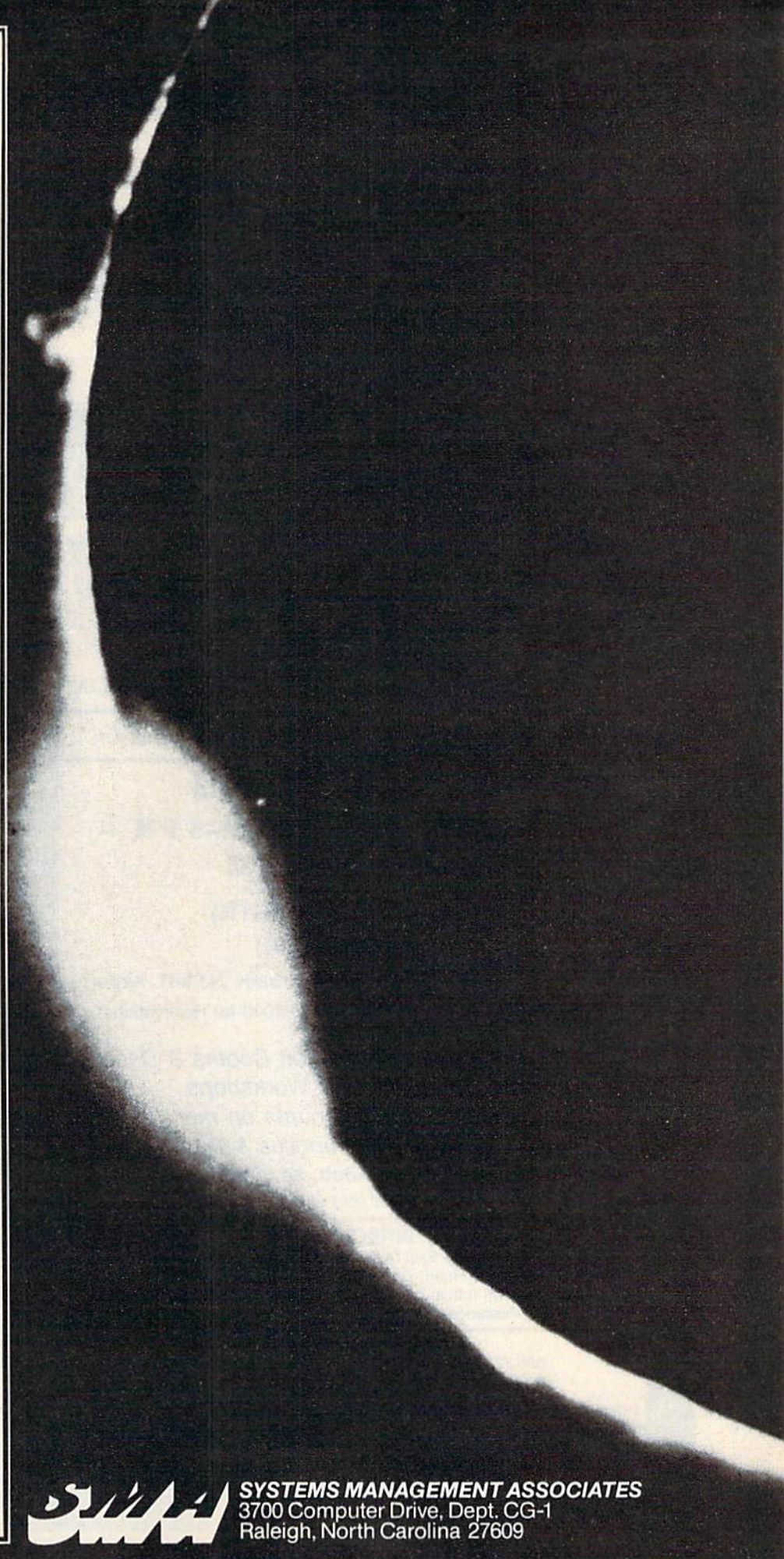

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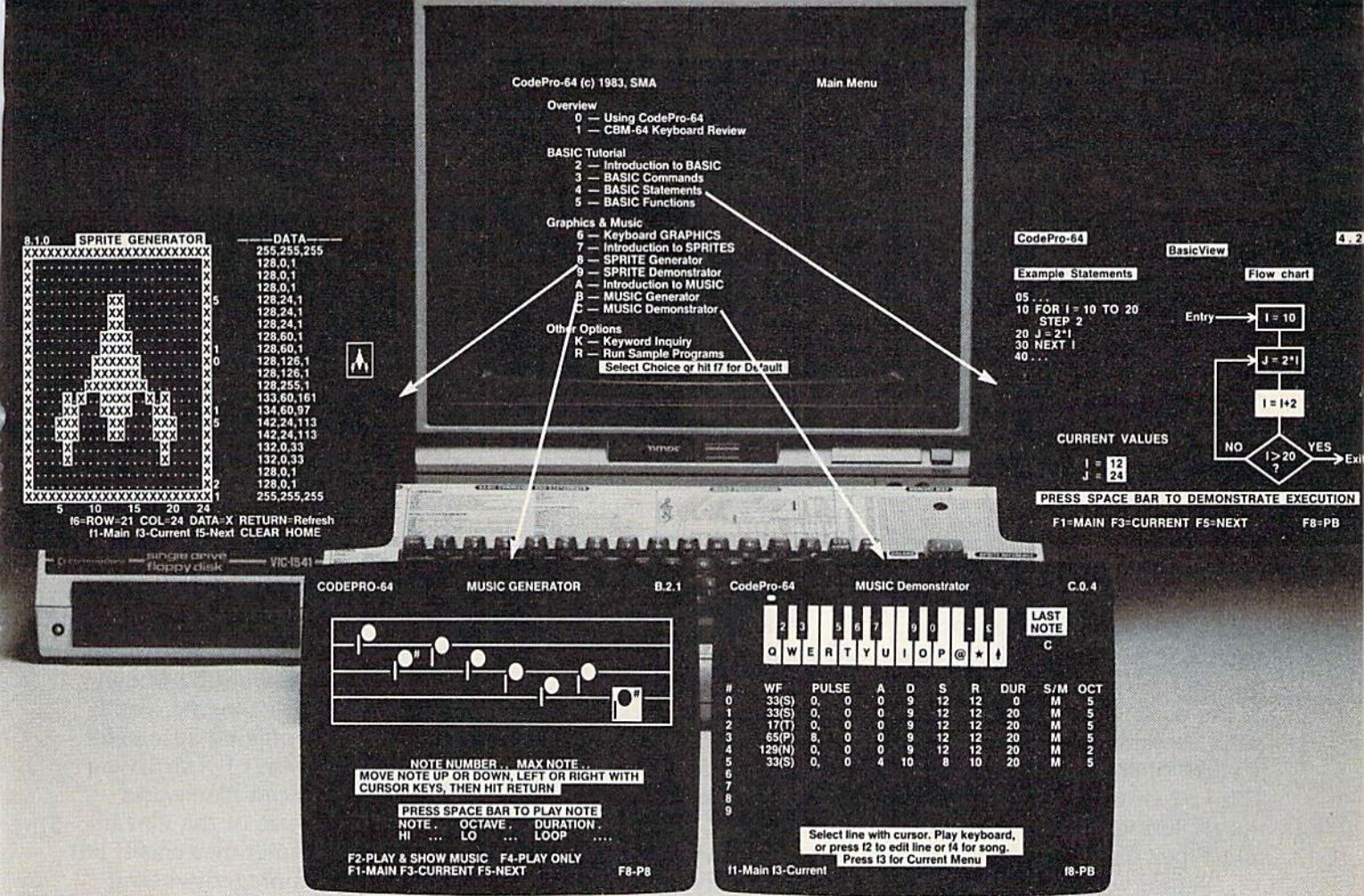
Commercial flight simulators were developed for one very good reason: Airplanes cost a good deal of money. When a student learning to fly makes a mistake, it's better for the mistake to happen in a simulation of an airplane safe on the ground than to lose an entire aircraft.

Some software companies have recently adapted flight simulators to personal computers. You can't expect to use these programs to qualify for a pilot's license, but they're both fun and educational.

A flight simulator combines strategy (how much fuel is left, what the airspeed and altitude are, etc.) with action (split-second decisions to climb or dive). Often you can choose the level of difficulty. You may want to go for a joy ride, swooping up and down among the clouds. Or you can make it into a game, where you have a specific goal—delivering the mail on time or shooting down enemy planes, for example.

Since flying a plane is more complex than driving a car, there must be some tradeoffs. If you want realism, the program must be fairly detailed. If you want playability (and fun), some aspects of "real" flight must be sacrificed.

Two flight simulators from two different companies well illustrate the tradeoffs. *Flight Simulator II* from subLOGIC is



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likely the most realistic in its approach; but its complexity may be daunting to a beginner. *Solo Flight* by MicroProse is perhaps easier to learn, but less realistic as a simulator.

subLOGIC's *Flight Simulator II*

If you know nothing about flying, *Flight Simulator II*, by Bruce Artwick, may overwhelm you. This is not a simple simulation. Your first step should be to read the manuals which are included in the package. The main handbook explains the keyboard and joystick operation of the aircraft. The FS2 is designed to simulate the performance characteristics of a Piper Cherokee Archer II.

Before you begin, perhaps you should read Flight Physics, the manual that explains how an aircraft operates. Once you know a bit about flying, you'll be better prepared to enjoy (and understand) the simulation. Even if you've done some flying, you'll benefit by reading the flight physics manual. It provides a good overview of a flight instruction class.

Once you've learned a little about flight physics, you should become familiar with Figure 1 in the handbook. It explains the various instruments you'll be working with. These instruments should be constantly monitored during flight because they indicate your airspeed, attitude, altitude, heading, and throttle at a glance.

Practice makes perfect. When using the keyboard, remove the flight reference card included in the package and have it in a strategic location for easy reference. Play around a bit to become familiar with the F, H, G, B, V, R, C, M, and T keys, and their uses. As you improve your flying skills, you'll learn how to use navigational aids such as the VOR, the ADF, the NAV 1, NAV 2, and COM radios. You can use the 3-D display window to look around you from nine different perspectives. Finally, there is the radar view, which is indispensable when taxiing on the runways.

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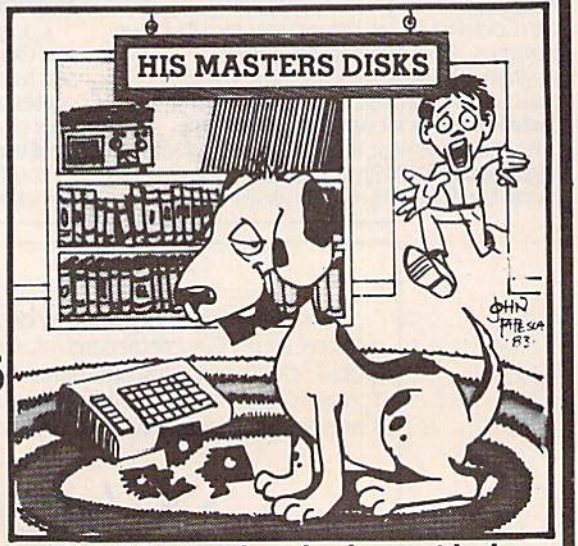

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In addition to the four regions available for civilian flight, there is a fifth, the World War I game in which you are placed in Europe in 1917.

One Of The Best

Flight Simulator II is interesting, challenging, graphically superb, diverse, rewarding, and just plain fun. And the documentation is great. In terms of realism, it sets the standards.

There are two slight drawbacks. The instruments are more delicate than on aircraft like the Piper Cherokee. There are legitimate arguments that this is the way a flight simulator should respond. On a computer simulation, some would prefer to see more realistic controls which give a response exactly like the real thing. The other drawback is the obvious one that applies to all computer flight simulators. The absence of rudder pedals and the controlling of the aircraft using keys or a joystick may befuddle pilots who are used to real controls. These drawbacks, however, are outweighed by the sheer delight this program brings.

Solo Flight By MicroProse

An exciting realtime simulation, *Solo Flight*, by MicroProse, offers sharp graphics and realistic controls. It allows the player to learn quickly, and to advance quickly into more difficult levels of play. This is a flight simulator that everyone can enjoy the first few times it is played.

You don't have to know a lot about flying to get going. Simply load the program and choose your options. There are three states in which to fly: Kansas, Washington, and Colorado. After choosing one of them (with or without the Mail Run) you can choose a difficulty level. It's probably best to start out on the student level.

Send your throttle up to at least 6 or 7, and pull back on the joystick as soon as your airspeed indicator (the dial on the right of the display panel) reaches 60. You're on your way!

You'll immediately notice the striking view displayed on the top half of your screen. You are inside the aircraft, but what you see is the rear of your plane, as if you were in another aircraft tailing the one you're flying. This gives you more time for making decisions while in flight. You see more of your surroundings, and at low altitudes there is even a shadow of the aircraft. Because of this view from behind, you'll not crash as much with *Solo Flight* as with other simulators.

If you've seen and tried other flight simulators, this one will seem easier to handle, particularly on the student and private levels. If you've flown a bit before, you'll find a challenge on the senior and command levels.

Use the arrow keys to get additional views of your surroundings. Look left, right, down, or behind to see exactly where you are.

The Instruments

Learning to fly well in *Solo Flight* depends on how soon you become familiar with the dials on your instrument panel. Get a feel for these and before long you'll be soaring. While the two large dials (altimeter and airspeed) and the one small one (attitude or artificial horizon) are important, don't overlook the four digital displays on the lower left. They give your pitch (position of the nose relative to the ground), flaps extension, directional compass reading, and climb. These become increasingly important as you move up in levels of play.

The instruments also include two VOR (very high frequency omnidirectional range) readouts. Use these as navigational aids. The ILS (instrument landing system) gives you an idea of what kind of approach you are making.

Learning To Land

As always, the most intricate part of flying is getting back on the ground. A combination of the Commodore 64's hi-res capabilities and the effective graphics designed by Sid Meier make landing this plane visually exciting.

The aircraft has landing gear, so don't forget to lower the wheels before you touchdown. You will find landing more involved than taking off, but after a few tries you'll improve.

Delivering The Mail

Also included in this software package is a game in which you deliver mail to different cities. You choose the state, and the computer tells you what cities to deliver to. Points are received

FIVE FOR THE C64 FROM MMG

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PHOENIX LAIR

PHOENIX LAIR is a ten board arcade game playable at any of ten speeds, and introduces a new concept to home arcade excitement: the interlude board. After each board, you are in a head-to-head joust for bonus points, making PHOENIX LAIR two games for the price of one! The ten levels of play begin with one training level, but rapidly escalate to complex levels requiring problem solving at arcade speeds. As the Phoenix, you must destroy the enemy's eggs found throughout your cave, to progress from one board to another. Different strategies and reflexes are required for each board, ensuring that PHOENIX LAIR is one home arcade game you won't soon master. Disk only; $29.95.

FILE-IT 2+

Finally! A user friendly package for your C64 to help you get organized. Designed to be used for your business or for your home, FILE-IT 2+ is an extremely easy to use, complete, powerful financial database management system. These programs can perform mathematical calculations on any selected fields of the six available, and can treat data either numerically or alphabetically. You can sort any field at machine language speeds for rapid sorting of up to six levels, and you can save both the sorted data and your original database separately. Most popular printers, and up to four disk drives are supported, and file merging is simple and straightforward. You can also use FILE-IT 2+ to print labels for your mailings! Use FILE-IT 2+ to follow your family finances or to help prepare your income tax. Disk only; $49.95.

TRIVIA TREK

This classic program is now available for the C64! Trivia fans—this one's for you. Rated 10 out of a possible 10 by independent review. Terrific at parties, or great for the whole family for nights and nights of fun. This multiple-choice trivia game allows two players to compete against each other or one player to compete against the computer, from a database of 500 trivia questions in 50 categories; the disk contains 2000 multiple choice answers for many evenings of fun. Even when you've exhausted these questions, the program allows you to add your own trivia questions and answers, either from classic trivia sources, from your own family history, or from your friends' and relatives' backgrounds. If you're looking for family fun with your C64, or for a really great party theme, TRIVIA TREK is the program for you. Disk only; $29.95.

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P.O. Box 131
Marlboro, NJ 07746
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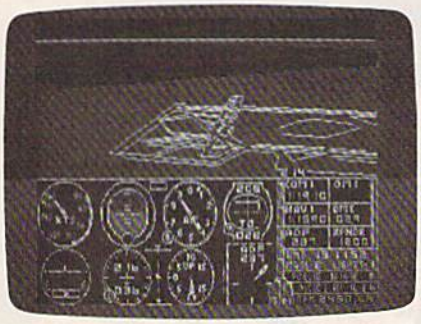
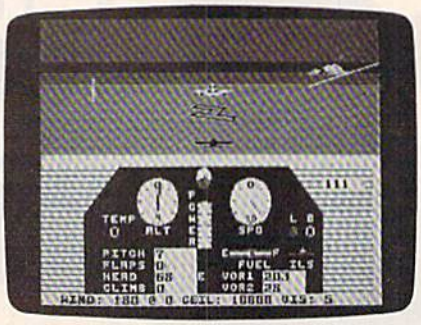


Approaching New York's Kennedy International in Flight Simulator II.



Note the shadow of the aircraft about to land in Solo Flight.

by choosing more difficult routes and levels, using little time, and delivering as much mail as possible.

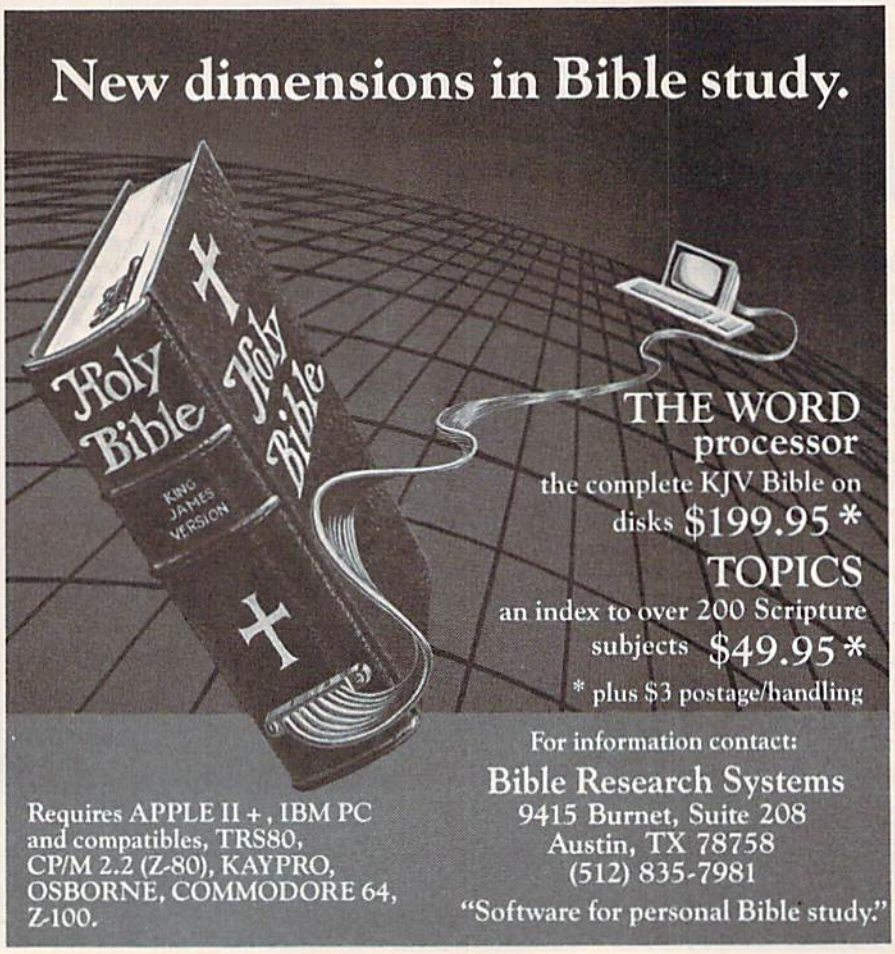
The interesting part of the game comes when the weather, which starts out fair, gets worse. Don't be surprised if your airplane turns, banks, or slips when you didn't want it to. If you deliver enough mail, you may even see clouds form on the screen. To make the scenario even more challenging, your instruments sometimes lose their reliability. When this happens, you must land at the nearest airport for repair.

Flying For Fun

The word that best describes *Solo Flight* is fun. You are rewarded quickly for good flying techniques. The game is easy to use, visually pleasing, and fast moving. And it's appropriate for those who don't wish to spend a lot of time reading, but would rather be flying.

Flight Simulator II
subLOGIC
713 Edgebrook Drive
Champaign, IL 61820
$49.95 (disk)
$39.95 (tape)

Solo Flight
MicroProse Software
10616 Beaver Dam Road
Hunt Valley, MD 21030
$34.95 (disk)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Calc Result: A Spreadsheet For The 64

Emily Herman

If you don't know how a spreadsheet program works, *Calc Result*, from Handic Software is a nice way to get acquainted. Two versions are available: *Calc Result Easy* and *Calc Result Advanced.*

The advanced version is not any more difficult to learn. In fact, the manuals are identical when covering features common to both versions. The most significant difference is that *Calc Result Advanced* can store twice as much information as *Calc Result Easy*. It also costs $70 more.

Built-In Functions

Both versions have a matrix of 63 columns and 254 rows, but, in fact, it's not possible to have a sheet that uses all these positions. *Calc Result Easy* can store about 1000 positions, and *Calc Result Advanced* about 2000. At each position on the sheet you can input labels (alpha, numeric, and special characters), or values (numeric data or formulas).

A good selection of built-in functions is available and may be incorporated in the formulas. Functions available are: COUNT, MAX, MIN, MEAN, STDDEV, SUM, NPV (net present value), ABS, FRAC, INT, LN, LOG10, SQRT, RND, IF-THEN-ELSE, OR, AND, and NOT. For example, at the end of a column of numbers, a position could contain the formula "MEAN(B1:B10)". This would calculate the average of the numbers in positions B1 to B10. The average (not the formula) would then be displayed on the sheet. If any of the numbers were subsequently changed, the average would automatically be recalculated. *Calc Result Advanced* also has trigonometric functions.

The cursor keys or a GOTO command are used to move around the sheet. You then type information into each position. Position contents can easily be blanked out or edited. At any point, rows or columns can be added, deleted, or moved. Values or labels can be replicated across or down the sheet. Numbers can be displayed in maximum precision, integer, or dollar and cents (two decimal places) format.

If a value is displayed in integer format, the decimal value is still stored in memory

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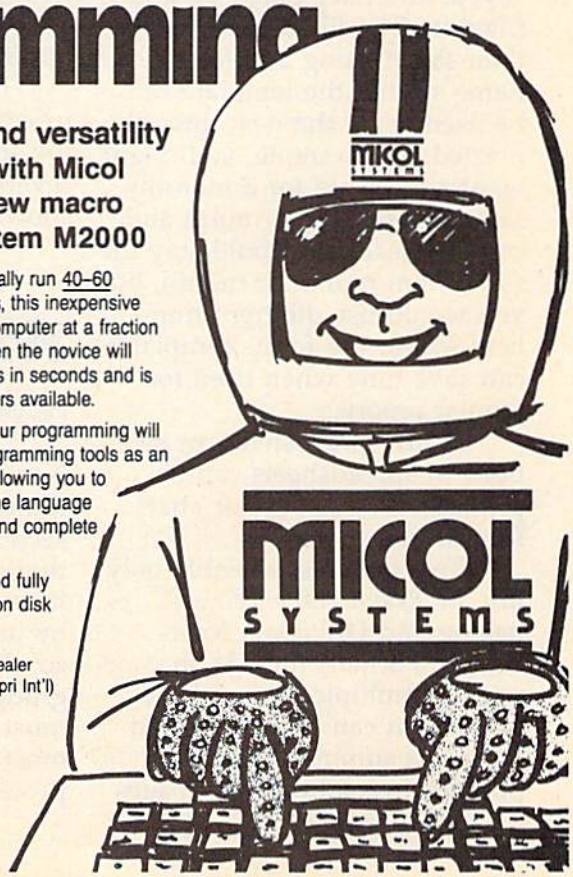

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and will be used for calculations. Labels are left justified and values are right justified, but this can be altered. Columns can be between 5 and 18 characters wide. The columns displayed on the screen are the same width, but they can be printed out in varying widths. A label that is longer than the column width is stored intact even though it is not displayed completely on the screen. Titles can be fixed so that they will be visible as you scroll across (but not down) the sheet. Formulas are calculated by columns, from left to right, but this can be changed to calculate vertically by rows.

Saving And Recalling

Spreadsheets can be stored and later recalled. Templates (a report form set up with headings and formulas) can be made, saved, and later called up and filled in. The filled-in form is then saved using a different name so that the template can be used again the next time it's needed. For example, you might want a template for a monthly sales report. The formulas and column headings would stay the same from month to month, but you would use different numbers within the form. Templates can save time when used for regular reports.

Entire spreadsheets or sections of spreadsheets can be printed out, even in bar chart form if you prefer.

Two features available only in *Calc Result Advanced* are paging and DIF (Data Interchange Format) files. With paging, multiple pages of the same form can be created and include a summary page. It's possible to load different pages at the same time. DIF allows data to be stored so it can be used in programs other than *Calc Result Advanced.* Files saved with this command save only the values derived by the formulas used in the spreadsheet, not the original formulas. Formatting information is not saved either. (In fact, I saved a spreadsheet with *Calc Result Advanced* and was able to load it in *Visicalc* on a CBM 8096.) DIF files are also very handy if you want to save part of a sheet and then incorporate it into another *Calc Result Advanced* sheet.

Calc Result Advanced also has help screens, and these are available in several languages.

The Manual: Not For Beginners

The manual does not have an index, an annoying omission for beginners. One must search through the table of contents and the manual itself to find information.

The novice will also be confused by some of the pictures of the screen in the tutorial. In several instances, the displays show what the screen will look like several steps later. The manual was also a little sketchy in places where I would have preferred more detailed information.

At the very beginning, a little discussion about the difference between SHIFT SPACE and SPACE (unshifted) would have been helpful for the computer novice. SHIFT SPACE is a toggle that indicates whether or not a position contains a label or a value. For the first example you are instructed to type in GROSS INCOME as a label. If you have SHIFT LOCK down when you type, your entry will change from a label to a value when you press the space bar for the space between GROSS and INCOME.

Overall, these omissions are minor in context, only annoying to beginners or, perhaps, first-time users. The manual is well organized and the program itself offers many good features, and is easy to learn and use.

Calc Result
Handic Software, Inc.
Fellowship Rd. B-206
Mt. Laurel, NJ 08054
Easy, *$79.95 (disk)*
Advanced, *$149.95 (disk)*

Write Now! For The VIC-20

Harvey B. Herman, Associate Editor

Not everyone likes computers. Many people secretly—or not so secretly—detest them and feel that certain applications ought to be done by real people, not by impersonal machines. Even so, these same computerphobes grudgingly concede that if we must have them, then their most appropriate use is word processing.

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categories; you could easily pay half the cost of a VIC for a word processor. Each company touts particular features which it claims will make your choice obvious. But which features are really important?

First, to begin your selection process, talk to your friends who have and use word processors. See if a demonstration can be arranged, and read reviews in magazines. And make certain it will work with your equipment. This last point is crucial and might be worth getting in writing. I can imagine the sinking feeling of 40/80 column board owners who read in their *Write Now!* manual, too late, that the program won't work with one.

Simple And Easy To Use

Write Now! for the VIC (a 64 version is available also) is, in a word, friendly. I don't subscribe to the view, held by some, that it can be used without a manual. Nevertheless, it is one of the easiest to learn of the word processors I've tried.

Here's why: It comes with an audio cassette tape which gives elementary lessons on program operations. It has keyboard overlays so you won't forget the meaning of special keys. And it has a professionally written, easy to follow, instruction manual.

A novice should find *Write Now!* unintimidating because it's so simple. When writing a paragraph, you keep on typing (never hitting RETURN) until the paragraph is finished. The program will format the lines properly on the final printout—a point first-time users find confusing on any word processor.

Formatting is controlled by "dot" commands on separate lines. For example, use ".ls 1" if single spacing of printed text is desired. Change the 1 to a 2 next time and you get double spacing without having to reload the whole document. No wonder everyone is smitten by word processors.

To better illustrate the dot commands, here's the way my screen appeared as I wrote this review:

```
.lm 5←
.rm 75←
.he 1 Write Now!←
.bm 3←
.ls 1←
.pl 66←
.pn 1←
.pc 15←
Review          VIC-20          Cart
ridge                           3/10/84←

Reviewed by Harvey B.
Herman←

Not everyone...
```

Plenty Of Features

Write Now! has many of the features of more expensive word processors, including search and replace, and a deleted character buffer. Search and replace allows you to change the spelling of one word appearing throughout a file. The delete character buffer is made for people whose fingers move faster than their minds. When characters are deleted, they are stuffed into a 256-character reserved area (buffer). If desired, the deleted characters can be recalled with one key press.

Space limits a full discussion of the many operations included with this word processor. At the end of this review is a brief summary of the operation of the special keys, whereby text is manipulated, loaded, and saved (disk or tape), etc., and the dot commands which control the formatting of the printout. You should keep a list of the dot commands nearby until you learn them. This is not necessary for the special keys because

Special Keys

Print	
Save/Load	
Dump/Clear buffer	
Free space	
Bottom of text	
Exit	
Set/Go to mark	
Delete word	
Search/Replace	
Options	
Block	– mark start
	mark end
	go to start
	go to end
	copy/delete
	write
Tab	– key/set/clear/display
Up/Down page	
File position	
Directory	

Dot Commands

.lm	left margin
.bm	bottom margin
.ls	line space
.cj	center justify
.pp	page pause
.rn	Roman numerals
.rc	redefine char
.sp	printer code
.bb	building block (for printing long text files)
.tw	text width
.pl	page length
.fj	fill justify
.pa	page advance
.wa	wait
.ru	Roman upper
.df	default
.pc	prefix character
.tm	top margin
.pn	page number
.lj	left justify
.cp	conditional page
.nc	number column
.he	header sequence
.es	escape sequence

of the overlay previously mentioned.

There appear to be two minor flaws. There is no word wrap and it may be awkward to interact with all printers. It bothers some people to see words broken up on the screen. For example, on the one I'm using now, "manuscr" appears on one line and "ipt" on the next. This doesn't happen with a word wrap feature. However, the alternative may not be practical on the 22-column VIC.

The other flaw, if you can call it that, is a consequence of the requirement that dot commands appear on separate lines. Some printers must receive elaborate character sequences to control operations, and dot commands would be used for this. Your text on the screen, consequently, is not continuous and is difficult to read and correct. This problem is not unique to *Write Now!*, however.

Write Now! is an excellent program for anyone who intends to do word processing on the VIC. It has features which make it very attractive, it's inexpensive, and it even works on an unexpanded VIC.

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Wichita, KS 67214
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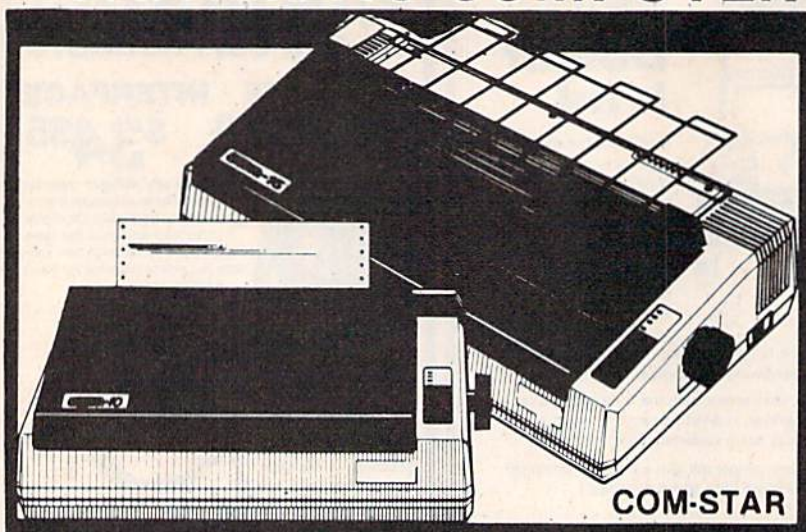

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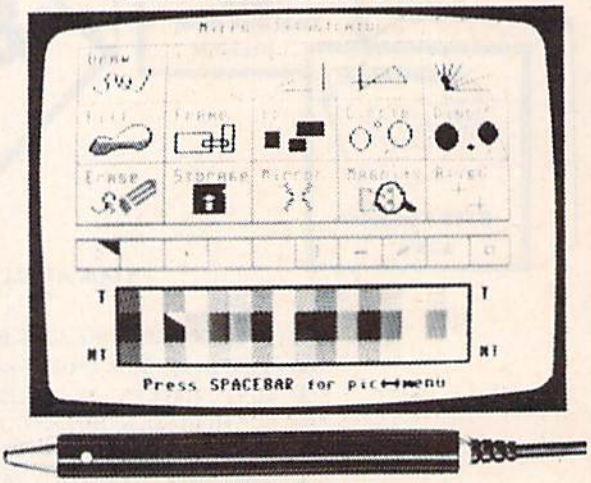

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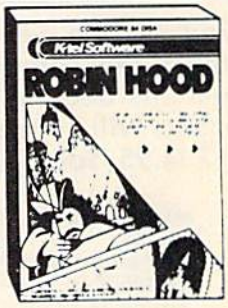
Speed Reading Coach — Teaches vocabulary, comprehension, and speed to help you read better. Eye training and vocabulary come first, then the screen flashes word by word or sentence by sentence through paragraphs and asks you questions when you're done. Fantastic Reading Aid. List $29.99. **Sale $19.99** (Disk).



Robin Hood — You as Robin must fight your way through Sherwood Forest, Nottingham Castle, past the Duke, rescue Maid Marion, and finally steal the gold. Fantastic graphics with 5 different screens of challenges. List $19.99. **Sale $14.99**. (Disk)

Ice Palace — You as the Penguin must make your way through the automated Ice Block Factory on your way to your true love. 3 screens worth of melting ice blocks, deadly snowballs, and Freddies Fire Demons try to stop you. Plus you must eat the fruit to keep your strength up and build an ice ladder before your love can be yours again. Fantastic graphics and action. List $24.95. **Sale $19.95.** (Disk)

Sir Lancelot — Fight your way through the castle, kill the dragons, and save the maiden. But this is just the beginning! 8 more quests with 8 more challenging screens await your rise to be knighted king of the realm. Fantastic graphics and sound. List $19.95. **Sale $14.95**.(Disk)

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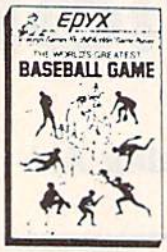

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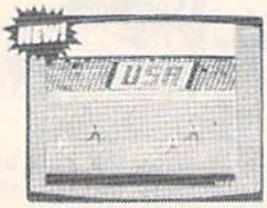

Summer Olympic Games — Now you can compete in the Olympics right along with the real competitors. Compete in track, skeet shooting, pole vaulting, diving and more. This Olympic game is so realistic it even includes a beautiful opening ceremony and an awards presentation after each event. (Highly recommended, by far the best Olympics game we've seen). List $39.95. **Sale $28.00**. (disk only).

Dragon Riders of Pern — Based on the best selling book series by Anne McCaffey (over 10 million sold). This program forces you to make an alliance with the Lord holders, then mount your dragon (stunning graphics) and battle the dreaded thread. (Super fast action with a great theme).
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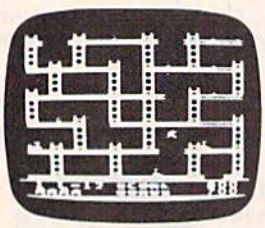

Jumpman — If you like Donkey Kong, you'll love Jumpman. Over 30 different screens with 8 speeds and 5 skill levels make this the fastest action game in the country. You must leap girders, climb ropes, and scale ladders to reach and diffuse bombs while avoiding robots, birds, bullets, explosives, crumbling walls, vanishing escape routes, and many other obstacles. (Truly a fantastic game!) List $39.95. **Sale $24.95** (Disk/Tape).

Temple of Apshai — ***(computer game of the year)***. This is the standard by which other adventure games are judged. Full color graphics portray the temple and all its contents — magic, monsters, doomed cities and damsels in distress. Do battle in real time with over 20 monsters, expansion modules will keep your adventure alive in the future. List $39.95. **Sale $24.95**. (tape/disk).

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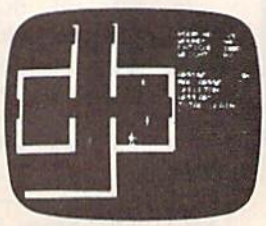

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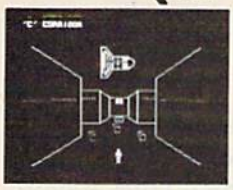
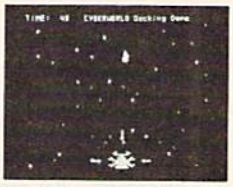


CYBERWORLD List $49.95 **Sale $34.95**



This five-screen arcade adventure packs the computer with intense graphics and sound! You are a special Cyberleague agent in a universe full of hostile aliens and vicious robots. Joystick and keyboard transport you through 3-D rooms, space barriers, fleets of invaders, and warship-ridden quadrants of space. Over 100 sprites, 8 new character sets, and dozens of mind-boggling sound effects make up this multi-layered adventure. Animation, action, and strategy all combined into a game so extensive that two disk sides are jammed with game programs and data! Reach the ultimate rank of admiral and you may carve a niche in the permanent high-score list. A full-size book quality manual with full-color covers is included to guide you through your most exciting game experience.

NEW

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Perplexian Challenger

List $34.95 **Sale $24.95**

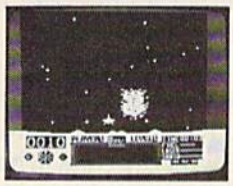
The incredibly responsive three-axis joystick control of a space fighter is in your hands. Split screen graphics provide a continuous display of your ship's instrumentation, as well as a three-dimensional, animated view of space.

You, as a pilot, must utilize lightning fast reflexes to destroy invading ships, and avoid their return fire. Simultaneously, you must maneuver your ship to capture space debris that remains from the explosions.

Outstanding graphics features include smooth 3-D rotations, split screens, and the most incredible high-resolution hyperspace sequence ever produced.

Programmed entirely in machine language, this action-strategy game is guaranteed to blow you away.

All the professional features you expect are included: automatic self-demo, high score retention, pause, and provisions for 1 to 4 players. Add to this, features you don't expect like easy-loading, and music during the load. Perplexian Challenger is a game that brings the arcade experience to your home.



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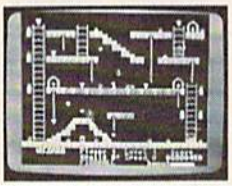
Jump from ropes to ladders, dodge plummeting boulders and duck under deadly arrows in your quest for sparkling diamonds, gleaming bars of gold, and glistening pearls. With joystick in hand you must explore forty dazzling screens, each a new and exciting adventure. Take the key to unlock the doorway to your next spine-tingling level. Each key restores your magical powers, allowing you to cast over ten different spells. With these magic spells you have the power to overcome vicious creatures, terrifying traps, and perilous plunges.

Your Wizard is realistically animated in every possible direction. Dozens of movements are possible — jump over burning fires, shimmy up or down ropes and ladders, even slip down treacherous sliding staircases! Magic portals move your Wizard through midair and protect you from a myriad of fully-animated fiendish monsters. Catch an elevator to the top of the screen and dart through sliding gates in your quest for magic and treasure.

Wizard's fascinating variety of screens are sure to please and entertain, and of course you can build an unlimited number of your own levels using the construction set provided with your game.



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MACHINE LANGUAGE FOR BEGINNERS

Richard Mansfield, Senior Editor

Loops And Branches

Branching, looping, and printing messages—these are among the most common computer activities. As you become familiar with machine language, you'll discover how to accomplish everything you can now do in BASIC (and a good deal more). But one of the first things you'll want to know is how to print messages to the screen and to a printer. This month let's explore looping and branching as a method of printing.

In BASIC, it's quite common to set up a loop and then branch out of the loop after a job is done. Here's one such structure which prints DATA statements:

```
10 READ X$
20 IF X$="END"THEN END
30 PRINT X$
40 GOTO 10
50 DATA SEND,THIS,MESSAGE,END
```

Here's the same thing in machine language:

```
10 *= 864
20 .P
30 .S
40 .O
50 ;   READ DATA FROM TABLE AND THEN BRANCH
60 ;
70 LDY #0; INITIALIZE INDEX
80 ;
90 LOOP LDA TABLE,Y
100 BEQ END
110 JSR $FFD2
120 INY
130 JMP LOOP
140 ;
150 END RTS
160 ;
170 TABLE .BYTE "SEND THIS MESSAGE":.BYTE 0
```

There are several things to notice here. We're using an assembler program which accepts BASIC-like programming. The general name for the program above is *source code* which, when an assembler assembles it, becomes a runnable, executable ML program (called *object code).* It's like BASIC because you can use line numbers, make remarks, even have multiple statements on a line separated by colons. The first line must contain the starting address, in this case 864.

Pseudo-Ops And Semicolons

Line 20 is a *pseudo-op* (a false op-code) which tells the assembler that you want a printout of the results of the assembly. (A real op-code, like LDA or JSR, is an instruction which your assembler can turn into ML code. A pseudo-op, by contrast, is a command to the assembler to perform some task which assists you in programming, but will not show up as actual, assembled object code.)

The .S pseudo-op in line 30 causes those assembly results to be listed on the screen during assembly and line 40 causes the object program to be stored in RAM memory.

The semicolons are like BASIC REM statements—anything after a semicolon on a line will be ignored. The first actual ML instruction appears in line 70 and sets up the Y register as a counter so we can take each character out of our message table in turn.

In line 90 we start the loop, using Y as an index to load the Accumulator with a character. If it's equal to 0, that's our signal to branch to END and thus RTS (ReTurn from Subroutine) back to BASIC. Notice that this kind of assembler doesn't rely very much on numbers. We're not branching to a specific address, rather to the label *END*. The assembler will calculate the proper address of the label and replace the word END with the correct number so that the BEQ (Branch if EQual) instruction will operate properly.

Anyway, if we're not through with the message, we JSR $FFD2, which is the routine in the VIC and 64 ROM BASIC which prints whatever character is in the Accumulator at the next available location on screen. Then we raise our index (INcrement Y) to point us to the next character in the table and JMP (jump) back up to the start of the loop. JMP is an unconditional branch. It always branches. The several 6502 ML instructions beginning with the letter B (BNE, BEQ, BCC, BPL, etc.) are all *conditional* branches. Sometimes they send you somewhere and sometimes they don't. They are little tests. In this program, the BEQ (equal to zero?) test will fail repeatedly as we step through the message. Finally, we'll LDA (LoaD the Accumulator) with that 0 on line 170

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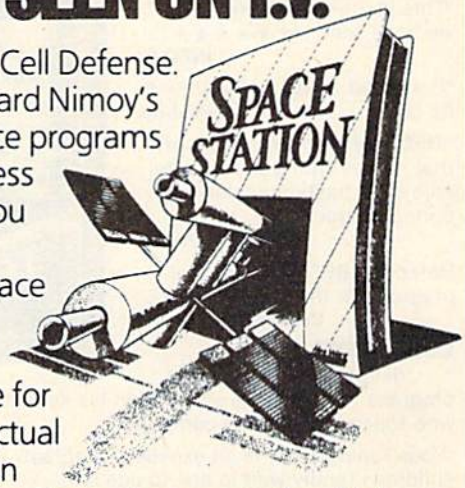

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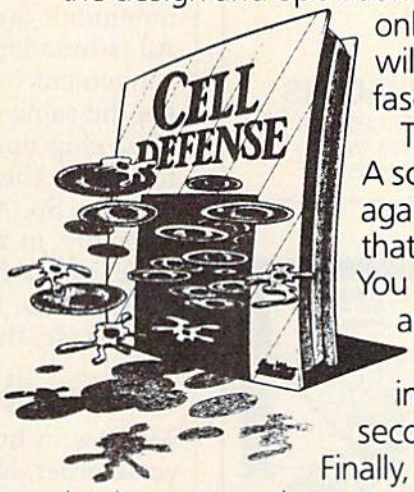

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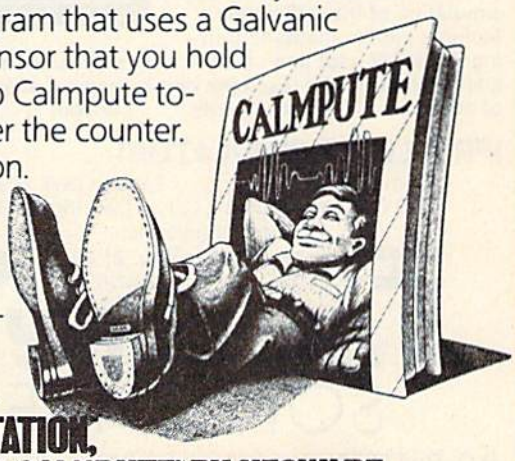

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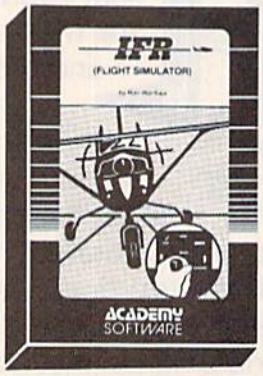

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which signals the end of the message. Then the BEQ test will send us down to END. We'll get to the pseudo-op .BYTE momentarily.

The .P pseudo-op in the program above causes the following information to be printed during the assembly of the source code:

```
50              READ DATA FROM TABLE AND THEN
   BRANCH
60
70 0360 A0 00                LDY #0  INITIALIZE
   INDEX
80
90 0362 B9 6F 03    LOOP     LDA TABLE,Y
100 0365 F0 07               BEQ END
110 0367 20 D2 FF            JSR $FFD2
120 036A C8                  INY
130 036B 4C 62 03            JMP LOOP
140
150 036E 60         END      RTS
160
170 036F TABLE .BYTE "SEND THIS MESSAGE
170 0380 .BYTE 0
```

It's similar to the source code, but something's been added. Look at line 70. Now, in addition to the mnemonic LDY and its argument #0, there's also the result of assembling that mnemonic/argument pair: A0 00. The number A0 is hexadecimal (called *hex*, it's a more convenient number system for working in ML). It's the same as 160 decimal. That's a number the 6502 chip understands to mean LDY #. The 00 is hex for 0, the value we want to load into the Y register. So, A0 00 is what will appear, after assembly, in addresses 864–865 in RAM memory (0360 is hex for 864, 0361 is hex for 865). In other words, this is a printout which includes the *object code*, the runnable ML program.

Automatic Assembly

See how in line 130 the address 0362 (in reverse order, as our microprocessor chip wants it) has now replaced the label *LOOP*? If all this is a bit confusing to you at first, get hold of a good assembler and start playing around with it. Much of what we're discussing will be automatically performed for you by the assembler itself.

Also notice the pseudo-op .BYTE in line 170. It allows you to enter literal ASCII code letters (using a quote the way BASIC defines strings) or literal numbers (no quote). This is the fastest way to set up data tables or messages in ML programming. You just give the line a name (*TABLE* in this example), announce a .BYTE series, and then write in whatever data you want. The printout loop technique we're using here signals the end-of-message with the number 0. So, .BYTE 0 sticks in a zero into RAM memory following the letter *e* in the word *message*. (The zero has to be outside of the quotation marks in a separate .BYTE statement since we're after the *numeric* 0, not the *character* 0.)

Before showing how to redirect messages to a printer, let's first explain what all these labels are doing. How can words substitute for numbers? After all, we want to JMP to address 0362 (866 decimal). Why not just write JMP 0362 and be done with it?

One significant advantage of using labels is that you can then freely modify your program without having to change all of the specific references. For example, suppose you write the following:

```
864 LDA 15
866 BEQ 869
868 INY
869 RTS
```

This would work fine because that branch to 869 is correct. But what if you later modified this program by inserting another INY? Or what if you deleted something between the branch and its target? The branch would still be to address 869 but that would be wrong. If, instead, you give the RTS a label:

```
864 LDA 15
866 BEQ FINISH
868 INY
869 FINISH RTS
```

you can change the other parts of this program as much as you want and the assembler will always make sure that the BEQ is correctly sent to the address of the RTS.

Other Advantages

With labels you can quickly modify programs in other ways, too. Let's imagine that you write a large game program and you frequently reset the background color. You have used #6 as your color in many places within the program. You've got LDA #6 sprinkled all over the place. If you later change your mind and want to use #5 instead of #6, you would have to locate every place where #6 appeared and change it to #5. If you had simply assigned a label at the start of the program: COLOR1 = 6 and then always used LDA #COLOR1, you could just change that first label assignment to COLOR1 = 5. All references to COLOR1 throughout the program would then automatically change as well.

These and other advantages of labels all contribute to a BASIC-like environment which can make sophisticated ML programming efficient and comfortable for the programmer. But let's now turn to the way you can communicate with your printer in ML. There are two things to do. Open a file (OPEN 4,4 is the BASIC equivalent) and then print a character to file #4 (PRINT#4,A$ in BASIC).

To open the channel of communication to

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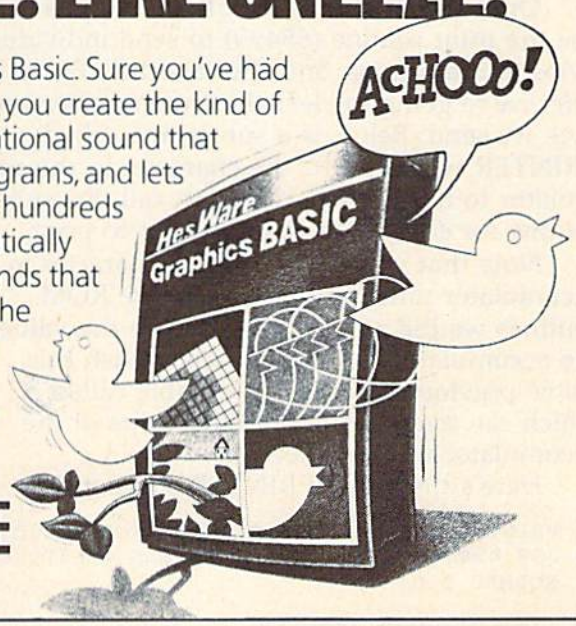

the printer, you use the following protocol:

```
10 OPEN4 LDA #4; FILE NUMBER
20 LDX #4;       DEVICE NUMBER
30 LDY #0;       SECONDARY ADDRESS
40 JSR $FFBA;    KERNAL SETLFS(SET UP LOG
   ICAL FILE)
50 LDA #0;       LENGTH OF NAME
60 JSR $FFBD;    KERNAL SETNAM (SET NAME)
70 JSR $FFC0;    KERNAL OPEN (OPEN A LOGI
   CAL FILE)
80 JSR $FFCC;    KERNAL CLRCHN (CLEAR I/O
    CHANNELS)
90 RTS
```

This is a subroutine called OPEN4 which can be invoked in your ML program by a JSR OPEN4. It uses the Commodore Kernal routines, which are common to the VIC and 64 (these same locations, with different device numbers, are used to open communications to a disk drive or tape drive). When it returns, it will have reset normal I/O (input/output) conditions for you in line 80. Normal I/O specifies that the screen is the output target and the keyboard is the input source. These conditions prevail unless the computer is notified otherwise. That's where the "chkout" and "chkin" routines come in. They are like PRINT# and INPUT# in BASIC, redirecting the output or input of a given character or symbol from the defaults to other, previously opened, files.

Now, whenever you want to send a character to the printer, you can invoke a PRINT# by LDX #4: JSR 65481, thus opening a channel of communication to the printer (file number four). It's similar to BASIC's CMD. Then, JSR 65490 is the general purpose print routine which sends the character in the accumulator to whatever device lies at the end of the currently open channel. Finally, you close the channel to the printer by JSR 65484 which restores normal I/O conditions.

Once the chkout routine is called, you can use the print routine (65490) to send individual bytes to the printer, one after another. But to be safe, we're going to clear the channel after each byte we send. Below is a subroutine called PRINTER which prints the character in the accumulator to the printer. You must call this subroutine for *each* character you want to print.

Note that you must save the character in the accumulator until you need it. Those ROM routines we JSR to will not preserve the value in the accumulator for you. To accomplish this, we've previously defined a variable called A which can temporarily hold the value of the accumulator until we need it.

Here's the entire PRINTER subroutine:

```
10 PRINTER STA A; SAVE ACCUMULATOR VALUE
20 JSR 65484;     CLEAR CHANNELS (RESTORE
   NORMAL I/O)
30 LDX #4;        PREPARE DEVICE #4
40 JSR 65481;     BY OPENING A CHANNEL TO
   THAT (PREVIOUSLY OPENED) FILE
50 LDA A;         RECOVER ACCUMULATOR VALUE
   TO BE PRINTED
60 JSR 65490;     PRINT
70 JSR 65484;     CLEAR CHANNELS AGAIN
80 RTS;           RETURN
```

Take another look at the first example above which prints PRINT THIS MESSAGE to the screen. To make it print to the printer instead, just replace the JSR $FFD2 in line 110 with a JSR PRINTER (our new subroutine). To have it print on screen and printer simultaneously, leave in the JSR $FFD2 and just add a new line right below it:

```
115 JSR PRINTER
```

Whenever you JSR to routines in ROM, it's a good idea to first save the numbers in the Accumulator and the X and Y registers if you will be wanting to work with these numbers further. ML programmers make heavy use of the registers, and the ROM routines like to use them as well. You cannot be sure that, after a JSR to ROM, you'll get back the same numbers in the registers. Luckily, the general print routine at 65490 ($FFD2) is *non-destructive*. It preserves the A, X, and Y registers. However, some other ROM routines will not offer this courtesy.

Notice that we're using the Y register (in the first example above) to index our printed message. To be on the safe side, set up a variable, called Y or something, and STY Y just as you STA A upon entry to the PRINTER subroutine. If you make a habit of saving important registers before ROM JSRs, you'll avoid one major source of ML program bugs.

To pull it all together, here are the steps you take to print a character to the printer. First you would JSR OPEN4 (to open a file to the printer), then load the character you want printed into the Accumulator, and finally JSR PRINTER to print the character. This seems like a struggle to print only one character, but once you've set up the subroutine, you simply put any character into the Accumulator and JSR.

At the end of an ML program, you'll want to close files and shut down communications to peripherals. Here's the way to close down our file to the printer:

```
500 JSR 65484;      SHUT DOWN PRINTER,
    GRACEFULLY.
510 LDX #4
520 JSR 65481;      OPEN PRINTER CHANNEL
530 LDA #13;        LOAD A CARRIAGE RETURN
    CHARACTER
540 JSR $FFD2;      PRINT IT
550 JSR 65484;      CLEAR ALL CHANNELS AGAIN
    (RESTORE NORMAL I/O)
560 LDA #4
570 JSR $FFC3;      CLOSE THE FILE
```

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Teaching Your Computer English

Michael A. Long

Would you like to talk to your computer? With the string handling techniques described in this article, it may seem like you are. For the VIC and 64.

The basic idea of an adventure game like *Zork* is that you play a character in a story. The computer describes the surroundings, and you decide what to do—search the room, listen at the door, fight the dragon, drink a magic potion, and so on. Your choices determine the direction of the story, which is why adventure games are sometimes called interactive fiction.

The heart of such a game is the *parser routine*, which splits apart the sentences you type and matches the words against a vocabulary list. Parsing is a computer's way of diagramming sentences.

Some adventure games include lists of acceptable but hard-to-understand commands. For instance, you may have to use G for get, + for up, and − for down. However, these should not be your only options when operating text adventures or other interactive programs. There are several techniques which allow the user to type in English commands such as *go north* or *open door*. One of the most useful of these techniques looks only at the first few letters of each word. Let's study the program for a simple six-room adventure game to demonstrate how it works.

Although the program will run on any VIC or 64, it will almost completely fill an unexpanded VIC, so type the program in carefully and without extra spaces if you're using a VIC without expansion.

If you have the inclination (and enough memory), you might want to add new commands, new treasure, and new rooms to this mini-adventure game.

Normal English Commands

This program demonstrates a technique used by many adventure programmers. It allows the user to input a command in normal English sentences. The only restriction is that the user must type in the verb first and the object (noun or compass direction) last. Only a few of the letters in the first and last word are actually read by the computer.

Lines 12–17 take care of screen printing and the input prompt. The user types in a sentence, and the computer stores it in variable A$. Lines 18 and 19 read through A$ using a FOR-NEXT loop and the MID$ function, looking for the space between the first and second words. Then the computer puts the two letters following that space into B$. At that point it is finished with the last part of the sentence and can discard it, a feat accomplished in line 20 by setting A$ equal to the first two letters of the first word in the sentence.

But the computer still can't use the values because they're letters rather than numbers. The variable V$, established in line 21, holds the first two letters of all the verbs you may use in the program, and line 24 does the actual numeric conversion. It sets up a FOR-NEXT loop in which the variable X increments from one to the length of V$. The computer uses the MID$ function to look at the two letters following X until it finds a match for the value in A$. When it finds a match, it then sets V equal to the number of the count, plus one, and then divides V by two. At that point you have the number of the verb you typed in.

Line 24 does the same thing, except that it is looking for a match in N$ (contained in line 22) for the B$ string. Lines 71–75 contain a list of all the nouns (N$).

You now have V equal to the number of the verb and N equal to the number of the noun. Suddenly, we're working with numbers, which are easier for your computer to manipulate.

Line 25 uses an ON-GOTO statement to send the program to different sections of the listing depending on which verb was used. For example, if you used the verb GO, the program would be sent to line 26. From there all you have to do is set up the logic needed to execute the command you want.

Line 69 is a DATA statement which holds the information for array M, the movement map for moving from room to room in the adventure. Lines 80–81 contain the information for R$, which holds the room names in the

program. Lines 77–78 are DATA statements for array L, the locations of all the objects in the adventure.

One more note. If you have two verbs with the same beginning letters (like PUT and PULL), you can do one of two things to ensure proper selection of the verb you want. You can read more than the first two letters of the verb, but you'll sacrifice some speed (and use a lot more memory).

A better alternative is to direct both commands to the same location in the program. When those verbs are used, the computer searches through the appropriate program lines and reads only the commands you put in for that situation. That way, you only have to store the first two letters in V$ one time, and you don't have to use another GOTO command with your ON statement either.

You can use a similar method to handle two verbs that mean the same thing but are spelled differently. For example, both *get* and *take* could send you to the same part of the program if you repeat the GOTO number in the ON statement.

Here's a list of verbs used in our example program:

GO = Go
GE = Get
PU = Put and Pull
TA = Take
HI = Hit
IN = Inventory
LO = Look

If you'd rather not type in this program, send $3, a *blank* cassette (no disks, please), and a self-addressed stamped mailer, and I'll be glad to make you a copy.

Michael A. Long
6640-B 105th St.
Ewa Beach, HI 96706

See program listing on page 171.

Program Variables

A$ = Inputed sentence, and first two letters of verb
B$ = First two letters of noun
V$ = Holds first two letters of all the verbs allowed
N$ = Holds first two letters of all nouns used
N$0 = Holds list of all the nouns for use by the program
M0 = Two-dimensional array for use as movement map
L0 = Location for all objects (nouns)
L = The room you are currently in
L5 = Holds screen and border memory location for VIC; used to change screen colors when changing rooms.
R$0 = Room names
Z = Used for Get statements
V = Numeric value of the verb
N = Numeric value of the noun

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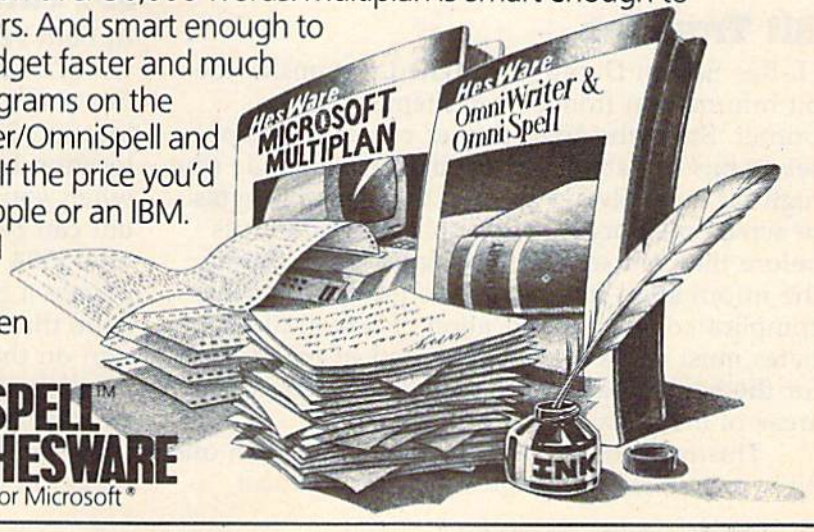

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Hi-Res Screen Dump

Gregg Peele, Assistant Programming Supervisor

Have you ever created a hi-res picture or graph and then tried to reproduce it on your printer? This program allows you to do just that. The VIC version requires a Super Expander cartridge. Both VIC and 64 versions are compatible with the Commodore 1525 or MPS-801 printers (but not the 1526).

Both the VIC-20 and Commodore 64 allow you to create high-resolution graphics images on the video screen. With the VIC or 64 Super Expander cartridge or another hi-res program, it's easy to produce detailed artistic creations. However, most of these programs don't provide a method of printing out these artistic endeavors once you've finished them. Unless you leave your computer turned on indefinitely, your creation is short-lived.

Both versions of "Hi-Res Screen Dump" work with a Commodore 1525 or compatible printer. (Note that the new 1526 printer from Commodore is *not* compatible with the 1525, and will not work with this program.)

Bit Transfer

Hi-Res Screen Dump is designed to transfer the bit information from screen memory to the printer. Since the 1525 printer can only accept seven bits of data at a time in graphics mode (the high bit must always be set), the eight-bit bytes in screen memory must be split into odd units before they are sent to the printer. Transferring the information from screen to printer is further complicated since the location of screen memory bytes must also be calculated, and hi-res screens for the 64 can be moved to several different areas of memory.

This program reads data from the screen one bit at a time starting from the lower leftmost corner of the screen. After seven bits, the program moves to the leftmost bit of the next row up and prints seven more bits, continuing up the screen. After the leftmost seven-bit column has been printed, the program starts at the eighth bit over from the bottom left corner and continues cycling from bottom to top until the entire screen has been read. Each seven bits are combined to form the byte to be sent out to the printer. Since the program reads from the left bottom side of the screen to the right top side, the printout is a 90-degree-turned reproduction of the screen image.

Both versions of Hi-Res Screen Dump are written in machine language. A BASIC loader (the first several lines of the program) puts the machine language (in the form of DATA statements) into the appropriate locations in memory. The BASIC loader also prompts you for the width of the printout, and the VIC version protects the machine language at the top of free memory. To operate the program correctly, *you must load and run Hi-Res Screen Dump before you load the program which creates the hi-res image.*

Selecting A Width And Making A Printout

In both versions, you can select either a single-width or double-width printout by POKEing a 1 (for single width) or a 2 (for double width) into location 2 (i.e., POKE 2,1 or POKE 2,2). This location is changed by your selection of width when you are prompted in the BASIC program, but can be changed at any time. A SYS to location 3584 (for the VIC) or 52224 (for the 64) will initiate a printout of the hi-res screen. You can issue this SYS in direct mode if you have a design on the screen, or add it to a hi-res drawing program if you make sure the machine language is loaded into memory before the SYS is encountered. Also, be sure that the printer is turned on before giving the SYS.

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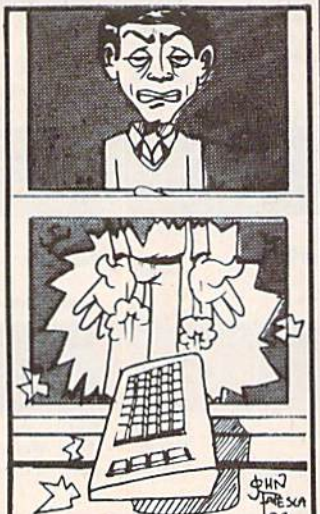

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Configuring The VIC

The VIC version of Hi-Res Screen Dump (Program 1) is designed to be used with the Super Expander cartridge. The GRAPHIC 2 command provided by the Super Expander sets up a 3200-byte high-resolution screen beginning at location 4096 ($1000), while maintaining the normal text screen beginning at location 7680 ($1E00). With the 3K of additional RAM provided by the Super Expander, BASIC program storage begins at location 1024 ($0400). Line 5 of the loader program reserves two pages (512 bytes) of memory for the machine language, just below the area to be used by the hi-res screen. Thus, the machine language starts at location 3584 ($0E00), and locations 1024-3583 ($0400-$0DFF) are available to BASIC programs.

However, using the VIC Super Expander alone leaves only 2-1/2K free for your BASIC programs. If you have an expander or motherboard that will allow you to add 8K or more of extra RAM in *addition* to the Super Expander, then you'll have much more room for BASIC programs. The machine language will still load into the 3K RAM area provided in the Super Expander, and SYS 3584 will still initiate the dump. This area is now untouched by BASIC, so be sure to remove line 5 before you attempt to run Program 1 in this configuration; otherwise you will get an ?OUT OF MEMORY message. The hi-res screen set up by the GRAPHIC 2 command is still 3200 bytes beginning at location 4096 ($1000), but BASIC programs will now start at location 8192 ($2000) and continue to the end of installed memory.

The 64 Version

The machine language for the 64 version (Program 2) resides at the top of the 64's free block of RAM above location 49152 ($C000). This makes it compatible with the *Super Expander 64*, but also means that it cannot be used with the 64 DOS wedge program, as both occupy the same area of memory. The program is designed to print the hi-res screen that is currently visible. If you want a screen dump when you are not in hi-res mode, POKE location 900 with the high byte of the starting address of the hi-res screen and SYS to location 52224+32. This alternate SYS bypasses the routine which determines the location of the hi-res screen. For example, if your hi-res screen starts at location 57344 ($E000)—as in "Screen-80" from the September issue—you would initiate the screen dump with:

```
POKE 900,(57344/256): SYS 52256
```

See program listings on page 180.

Robert Sims, Assistant Editor

All The Fun That's Fit To Print

For even the most dedicated computer owner, there comes a time in the serious and brow-furrowing process of learning to telecommunicate when what is needed most is a good, hearty laugh.

Most of the bulletin boards and services on the communications networks do not focus on humor (the Artsig on CompuServe and almost any special interest group on Delphi excepted). It is often the local bulletin board which is the repository of fun and of the absurd.

A Perpetual Party

Experienced modem owners use their local bulletin boards as a kind of perpetual party of the mind, a conversational free-for-all with everybody dropping in and out willy-nilly. Occasionally, a sysop will see the sense in all this nonsense and try to bring a touch of order into the chaos. A good example of this organized hilarity is *The Modem Times*, an electronic magazine originating in Colorado Springs. The magazine, brainchild of editors Jennifer Petkus and James Bates, is one of a kind in electronic publishing.

The editors don't seem to be sure of exactly what they've wrought—a bulletin board, a literary magazine, or a no-holds-barred forum of opinion for their subscribers. If they ever adopt a slogan for their masthead, it might well be "All the fun that's fit to print."

The Jocular Vein

The *Times* is structured much like a conventional print newspaper or magazine, with a table of contents, editorial comments, letters to the editor, features, and fiction from very obscure authors. There the similarity ends.

From the ersatz history of the publication (in which it is revealed that ancient astronauts founded the magazine along with the Egyptian and Incan civilizations), to the apologia for its editorial stance ("If you think our editorial page is offensive, send $20 and some suggestions"), *The Modem Times* is dedicated to the proposition that there is not a serious bone in the entire body politic.

A Comic's Dream

The Modem Times and its electronic kin add a new dimension—participatory zaniness. For the first time in the history of the funnybone, audience and performer are essentially indistinguishable.

Any subscriber can rise from the ranks to become an instant type-in comedian, uploading a joke and leaving before the audience begins to laugh or throw overripe vegetation. It's the best of all possible worlds for a comedian: You get your chance in the spotlight, but you're never there when you bomb.

The Modem Times is not all jocularity, of course. It provides a creative outlet for writers of short fiction and poetry. The magazine even has a section, "The Modem Times Won't Be Bought," set aside just for soap-box speeches and tirades on any subject. Here subscribers are encouraged to engage in polemic to their hearts' content.

The Laugh Stops Here

Unfortunately, navigating the magazine is not as much fun as its contents. The software that runs the magazine is adapted from an ordinary bulletin board, with a long list of commands to memorize, and a main menu containing 24 options.

A help file and explanation of commands and options are readily available on-line, and the commands will be familiar to experienced bulletin board users. But the beginner will do well

to first download and print out the help file (Page 13) before venturing further. It's difficult to maintain a literary frame of mind if you have to keep jumping to the instructions between pages.

A Common Problem

This navigation problem is not unique to *The Modem Times*, of course. Whenever a program is written to allow a specific computer to communicate with a variety of terminal programs on different computer models, it is necessary to use the ASCII control codes and character set so the computers will have a common language.

Two of the ASCII control codes are standard in almost all telecommunications situations. CTRL-S, a CHR$(19), and CTRL-Q, a CHR$(17), are recognized by most terminal software to mean "stop transmitting" and "resume transmitting," respectively.

Such standard codes can be transmitted automatically. But the meanings of other commands and control codes vary widely among bulletin boards and terminal programs. Consequently, the user must learn the necessary commands or codes and transmit them manually.

More than any other aspect of home telecommunications, electronic publishing points out the need for integrated software. In its infancy, we expect to make the best of what's available. But as electronic publishing matures, we can expect to find fewer technical distractions.

Forgettable Software

The reader is after entertainment, not programming tips or technical information. The software serves no purpose but to connect the reader and the magazine, and it should be transparent. In addition, it should be comprehensive. Instead of targeting the lowest common denominator, ASCII, electronic publishing software needs to be sophisticated enough to exploit the best sound and graphics features of each computer model by exchanging codes with the terminal program to discover the caller's computer type and automatically set transmission rate, display width, and other parameters.

In this ideal world of the possible future, each subscriber will receive a dedicated terminal program which will require no more technical expertise than the ability to connect the modem and load and run the program.

But until that millenium arrives, we'll have to be content to log onto *The Modem Times* and deliver a tirade on the subject.

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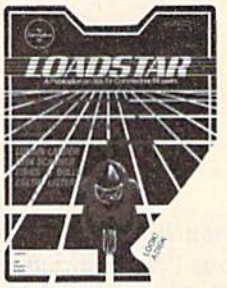

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SIMPLE ANSWERS TO COMMON QUESTIONS

Tom R. Halfhill
Staff Editor

Q A

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by new Commodore 64/VIC-20 users and by people shopping for their first home computer.*

Q. ***I'm confused! Your instructions concerning powering up the 1541 disk drive indicate that the computer should be turned on first ["Simple Answers To Common Questions," August 1984]. My* VIC-1541 User's Manual *(published 1982) at the top of page six says the following: "It is important that you turn on the devices in the correct order. The computer should always be turned on* last. *As long as the computer is the last one to be turned on, everything will be OK." Which is correct?***

A. We've received a couple of similar letters quoting from that paragraph in the Commodore manual. However, there should be no cause for confusion. In practice, the order in which the computer and disk drive are switched on almost never matters.

This is particularly true of one-drive systems without a printer. Occasionally we've heard of problems when certain printers are part of the daisy chain (the chain of peripherals plugged into each other). Sometimes the computer locks up when such a system is turned on in the wrong order. The Commodore 1526 printer had this problem, but it was temporarily recalled by Commodore because of internal bugs. Most printers cause no difficulties when hooked into the daisy chain.

We've also heard that multi-drive Commodore 64 systems can be sensitive to the power-on sequence. (Of course, keep in mind that any multi-drive system will lock up if the device numbers of the additional disk drives aren't changed; otherwise all the drives will contend for the computer's attention at once.) Interestingly, about a year ago Commodore issued a technical bulletin to dealers recommending the proper way to switch on various Commodore 64 systems. The bulletin stated the exact opposite of what the *VIC-1541 User's Manual* says—the computer should be turned on *first*, not last. Here are the power-on sequences that the bulletin recommended for various systems with 1541 disk drives and Commodore printers:

1) **64, 1541, 1525E.**
2) **64, 1541, 1541.**
3) **64, 1541, 1541 or 1525E** (only one or the other may be on).
4) **64, 1541, 1541, 1526.**

But again, let us repeat: With one-drive systems, in our experience it really makes no difference which device is turned on first.

Why? Partly because of the unique way Commodore handles its Disk Operating System (DOS). Briefly, DOS is a program which allows a computer to interact with a disk drive. Without DOS, a computer and disk drive couldn't communicate. Therefore, all computers hooked up to disk drives require some type of DOS.

Commodore's DOS is permanently stored inside the disk drive on a Read Only Memory (ROM) chip—which is why the 1541 is sometimes called an *intelligent drive*. But with Apple, Atari, IBM, and almost all other systems, DOS is stored as a program file on a floppy disk. DOS must be loaded from this disk into the computer's memory each time the system is turned on. This process is called *booting up*, because in a sense the computer is pulling itself up by its own bootstraps.

For example, with Atari computers you must turn on the disk drive before the computer and wait a few seconds for the drive to initialize, just like a 1541. But next you must insert a disk that contains the DOS program—called a *DOS disk* or *system disk*—and only then

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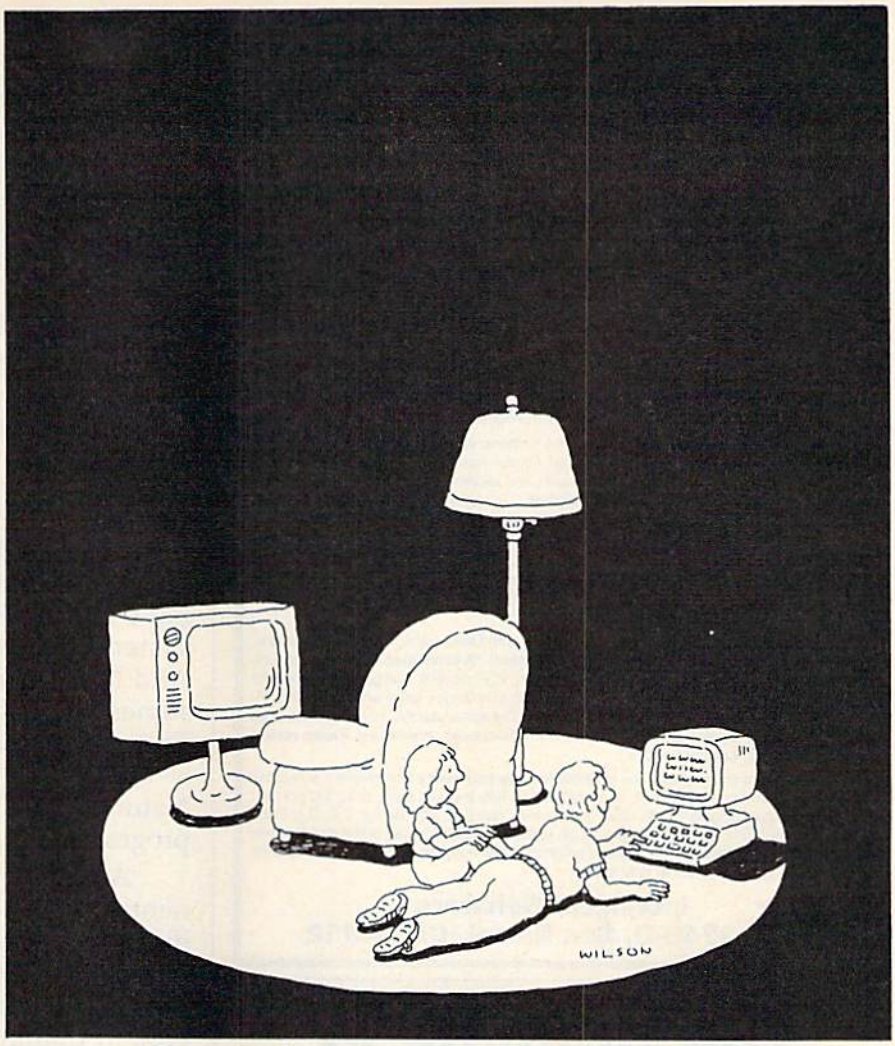

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switch on the computer. The first thing the computer does when it "wakes up" is load the DOS program into memory. Then it's ready. The procedure for booting up an Apple or IBM system is very similar, except you don't have to switch on the disk drive first because it's powered by the computer.

There are three main advantages to Commodore's method of storing DOS on a ROM chip inside the disk drive instead of loading it off disk. First, you don't have to wait around for the system to boot up. You just switch it on and it's ready to go. Second, you don't have to fool around with system disks. Because DOS can take up a fair amount of space on a disk, many people leave it off most of their disks to make more room for other files. But then they have to shuffle through piles of disks to find a system disk whenever they have to boot up. And third, loading DOS into the computer consumes valuable Random Access Memory (RAM). This can amount to about 10K on an Apple, 5–11K on an Atari, and 24K on an IBM PC/PCjr. Naturally, this leaves less room for your other programs.

As usual, though, there are tradeoffs. Permanently storing DOS on a ROM chip has some disadvantages. The main drawback is that the manufacturer can't revise DOS without making a new ROM chip. Let's say a serious bug is discovered in Commodore DOS. To fix it, Commodore would have to halt production on the old ROM chips, modify the DOS program, burn a new master chip, start production on the revised ROMs, and finally substitute them for the old ROMs on the assembly line. Not only would this take weeks and cost thousands of dollars, it could also trigger a supply shortage while the drives were out of production, resulting in lost revenue and unhappy customers. Besides that, people who already bought a disk drive would still be stuck with the faulty version of DOS. To fix it, they'd have to get the revised ROM chip, take apart the disk drive, pry out the old ROM, and replace it with the new one. Consequently, bugs which crop up in Commodore DOS usually go uncorrected—at least until the next model disk drive is introduced.

When DOS is stored on disk, the process is a little easier. The manufacturer simply revises the DOS program, prepares a fresh master disk, and saves the new DOS onto all system disks duplicated from that day onward. Updates and improvements to DOS can be made just as easily. To avoid confusion, the revision number of DOS is advanced a notch.

HORIZONS: 64

Charles Brannon
Program Editor

Following my review of Simon's BASIC in this column, several readers responded. Not all agreed with some of my points. I stated that some of the commands are a little unnecessary, such as CENTRE A$ instead of PRINT TAB(19-LEN(A$)/2);A$. Many readers are glad to have these extra commands. For example, LEFT and RIGHT, which scroll the screen left and right, seem pretty specialized, useful only for screen scrolling, but some readers have used these commands in new, ingenious ways. Some folks even convert BASIC programs from the GAZETTE into Simon's BASIC for speed and special effects.

However, some readers also lament that they cannot share their Simon's BASIC programs with friends who lack the cartridge. Unfortunately, it's unavoidable. With enough machine language, though, you can convert a Simon's BASIC program into a BASIC program everyone can use. We prefer this approach, since it makes the program available to the widest possible audience. There is still no indication that there are enough owners of Simon's BASIC to justify the publishing of programs in Simon's BASIC—programs that would be useless to the majority of our readers. This may change, though, so we'll keep you posted.

It turns out that some versions of Simon's BASIC do not work on some models of the 64. Reader John Walker bought Simon's BASIC and found that it would not run on his machine, but worked fine on a friend's. He went to a local computer store and was told to PRINT PEEK(65408). This returns a number that you can use to distinguish between the various 64 Kernal ROM versions. He was told if PEEK(65408) returns a 0 or a 3, then Simon's BASIC will work on your machine, but a 170 is bad news for Simon's BASIC enthusiasts. Mr. Walker wrote Commodore and received a new Simon's BASIC cartridge that works fine on his computer. Commodore itself said that the problem is in the cartridge, not which version of the 64 you own. And Commodore seems to have fixed the problem.

Kernal Knowledge

We called Commodore and found that there are at least three versions of the Commodore operating system, a.k.a. the Kernal. The third and latest version has been around since the beginning of 1984. The SX-64 has a fourth, somewhat more radically changed, Kernal ROM. The genealogy of the 64 Kernal ROM is covered in detail in "Commodore 64 ROM Generations," by Jim Butterfield, in the July 1984 issue of COMPUTE!. We'll paraphrase some of it here for those of you who missed that issue. The differences between ROM versions are minor. In revision one, color memory is always filled with white when you clear the screen. Revision two fills color memory with the current background color. What this means is that if you POKE to screen memory without also POKEing a color byte (for example, press RUN/STOP–RESTORE and then POKE 1024,1), you will see a white character on revision one, but on version two the character is invisible. This was an attempt to cosmetically eliminate the sparkle problem, which plagued the earlier machines.

On the SX-64 portable, when the screen is cleared, color memory is filled to the current cursor color, found at location 646. Programs which do not explicitly set color memory, or take advantage of the effect upon screen memory when you clear the screen, can give strange effects when running on a different version of ROM. It doesn't make sense to count on certain undocumented side effects resulting from Kernal calls, since there is no guarantee that these side effects will be preserved on future ROM generations.

The other significant change is that when you load a program from tape on a revision one 64, the computer waits forever after displaying "FOUND program name" until you press a key. The screen blanks, then the load proceeds. On revision two, the 64 waits a few seconds for you to read what it has found, then it goes ahead and loads the program.

When Commodore first marketed the 64, there were separate ROMs for the U.S. and European markets. In the United States, the NTSC standard is used for television broadcasts. Since the RF modulator in your 64 is essentially a tiny television station, the 64 has to conform to the local television standard.

A Universal Operating System

The European television standard, called PAL, has 625 television scan lines, versus 525 for NTSC. This results in a better quality picture. A NTSC screen has a 60 Hz rate (60 frames a second), while PAL uses a 50 Hz rate. Since the computer has to synchronize itself with the television display, the clock crystal runs at a different speed on European 64s than it does on U.S. models. The ROMs must also synchronize themselves with the proper speed, so that the software-supported RS-232 interface will run at the proper baud rate.

Instead of producing separate ROM sets, Commodore programmed a "universal" Kernal that determines which TV standard the hardware conforms to. A raster scan is set to interrupt on scan line 622. Since there is no scan line 622 on U.S. televisions, the interrupt doesn't happen, and the 64 assumes the NTSC standard. The ROMs then make the necessary software adjustments. Jim Butterfield warns that you can't count on the raster register to hold a zero value, since on this ROM it has already been used.

The various Kernal ROMs can cause some programs to be incompatible with other 64s, but it is easy to write a program that is ROM independent. To paraphrase the Commodore representative we talked to, "We don't like to emphasize the differences between Kernal ROMs. You get users who can't format a disk and then blame it on which Kernal they have." The point is well taken. As a programmer, many times I've wanted to blame the hardware for a bug in my program, but sooner or later, I find my mistake. Blaming the hardware should always be the last resort. Too many people have returned portable radios for repair when the batteries have been installed incorrectly.

Problems With CP/M, Too

With that in mind, there does seem to be a hard ware-related problem with both Simon's BASIC and the Commodore CP/M cartridge. A large New York users group, which has "undertaken the mammoth project" of converting the best public-domain CP/M software to 1541 format, has suggested that CP/M will not work on some newer model 64s. They are requesting feedback from CP/M owners to help identify the problem. If you want to aid them, they need to know: Do you have a working 64 CP/M system? If not, describe the problem. What number does PEEK(65408) return? What is your 64's serial number? Are the back slots silver or copper? If you want further information on their CP/M project, or wish to aid them in identifying the CP/M problem, write to:

NYC VIC-20/C64 User Group (CP/M SIG)
c/o NYACC
P.O. Box 106
Church Street Station
New York, NY 10008

Reader/contributor Art Hunkins has reported that the sound quality in the most recent 64s is much improved. For example, the release part of the sound envelope now cuts off cleanly, without an annoying sound residue. Volume changes are smoother. Commodore explains it in terms of manufacturing. The SID chip, a Very Large Scale Integrated Chip (VLSI), has a much higher circuit density than LSI chips such as the 6502. After a SID chip is produced, it is tested and graded for quality. When the SID chip was high in demand and low in availability, the tolerance for error was raised, letting more marginal chips squeak through. Now that the SID chip is cheap and plentiful, Commodore can afford to be more picky, and only the cream of the crop get into production 64s. Naturally, the sound quality is better.

Commodore 64 video quality is also at an all-time high. Sparkle is just a bad memory. Sprites are clean and sharp, and colors are bright. There is still RF interference on some televisions, but color smearing on ordinary TVs is much less of a problem.

Pascal For The 64

From the people who developed the PETSpeed BASIC compiler comes *Oxford Pascal*. PETSpeed was (and is) extremely impressive. It can compile any BASIC program, and fully supports integer math. PETSpeed is truly fast, one of the few optimizing compilers available on 6502 systems. We haven't seen the 64 version of PETSpeed, but have worked with the PET version. As might be expected, *Oxford Pascal* is an equally professional product.

It's not easy to implement a powerful Pascal system on a microcomputer, but *Oxford Pascal* is a good, usable language. When I first encountered Pascal, I was suspicious. Pascal, with its indented statements and mandatory semicolons, smacked of rigidity. It seemed to be a language that was not intended for programming, but for teaching programming.

But Pascal does not enforce "pretty printing"

or flowcharting. In fact, Pascal is very similar to BASIC in many ways. It has excellent control structures, which give a programmer more, not less, flexibility when programming. I've always agreed that GOTO 100 was fairly meaningless unless you looked at line 100. With Pascal, you never need to use GOTO. It's not so much that GOTO is illegal—it's available even in a structured language like Pascal, but with so many luxurious features like IF..THEN..ELSE, REPEAT..UNTIL, WHILE, and CASE, you truly never want to use GOTO again.

Pascal programs are inherently easy to read, thanks in part to these control structures. Which one of these examples do you prefer?

BASIC: FOR I=100 TO 1 STEP-1:PRINT I:NEXT
Pascal: FOR I:=100 DOWNTO 1 DO WRITELN (I);

Modulation

Another powerful feature of Pascal is that you can write programs in modules. (By the way, modular programming and structured programming are not necessarily the same thing.) Each module is a procedure, which you call by name, rather than the cryptic GOSUB 5128. You can pass *values* as parameters to these procedures, rather than using variables. Variables within a procedure can be local. A local variable within a procedure can have the same name as a variable in the main program, or in another procedure, but there is no debugging nightmare of renaming variables used in two different parts of the program.

Procedures also make designing a large program easier. Instead of trying to write and debug a huge, continuous program, Pascal lets you write and test modules separately, then bring them together to form a program.

Compiling Vs. Interpreting

Unlike BASIC, which is interpreted line-by-line as it is executed, a Pascal program must be compiled into machine language or pseudo-code (a high speed interpreted "virtual" machine language) before you can run it. When BASIC is running a program, it looks at each character or command, interpreting, checking for errors, and making decisions all along the way. With a compiler, some of these decisions (such as how much memory to reserve for an array, or the actual address where a GOTO should jump to) are solved during the compilation process. A compiler also translates the program into a faster, simpler, more efficient language (called P-code in most versions of Pascal), which is then executed by a high-speed interpreter. A *native code* compiler translates your program directly into machine language. This machine language program can then be loaded and run just like any machine language program. The difference in speed can be phenomenal.

Since Pascal is designed to be easy to compile, unlike BASIC, there are some concessions you must make for the sake of fast, efficient compilation. Every time you want to use a variable, you must declare its name and type (e.g., integer, floating point, character). The end of a line is not a statement terminator, since you can carry some statements across many program lines. So even if you only have one statement on a line, you must separate it from the next line by putting a semicolon at the end of the statement. Semicolons are the most confusing part of Pascal. I wish someone would write a compiler clever enough to obviate them.

BASIC was designed to be easy to learn and accessible to the masses (that's me and you). Pascal seems to have been designed *by* programmers *for* programmers. Because it lends itself to structured programming, it has become ideal for teaching programming. A teacher can find it hard to grade dozens of wildly different BASIC programs. Pascal is sometimes blamed for encouraging conformity, but this is really a product of the educational programming environment. As it turns out, large companies which hire Pascal programmers out of college also prefer programmers who write neat, well-documented, structured programs.

But we aren't programming for IBM, are we? Why would you want to program with Pascal on a microcomputer? One good reason is if you are taking Pascal in school. If you have a powerful microcomputer Pascal, you can write and debug your programs at home, instead of having to wait for a terminal on the university's huge timesharing system. But most persuasive of all is that the microcomputer environment lets Pascal be more interactive than it is on these behemoth machines.

For example, it always seemed cumbersome to write a Pascal program with a line editor, save it, compile it, link it, then run it. BASIC is so much easier—just type RUN. Well, *Oxford Pascal* lets you do the same thing. No more write-compile-link-execute. Just type RUN, and your program in memory is quickly compiled and run. *Oxford Pascal* makes Pascal as "friendly" as BASIC in this regard. Another bonus from compiling, aside from the higher speed you get from an interpreter, is that some programming errors will be detected before the program is executed, saving you hours of debugging a flawed program.

In this interactive mode, *Oxford Pascal* does

not have the memory to fully support all the advanced features of Pascal, but it has a separate disk-based compiler that supports every Pascal feature you could ask for. Only the speed and memory of a microcomputer limit what *Oxford Pascal* can do.

Since Pascal is compiled, I expected it to run extremely fast. However, although *Oxford Pascal* is zippy, it's not as fast as some BASIC compilers I've used. Pascal is a higher level language than BASIC, though, so you sacrifice some speed for programming power.

The *Oxford Pascal* manual is short and tutorial. It isn't sufficient to learn Pascal with, but is a good place to start, and serves as a reference while you're learning. There are some errors in the text and example programs, but not enough to invalidate the manual. An errata sheet clears things up. BASIC is not the end-all of programming languages, and if programming turns you on, you owe it to yourself to find a language you really feel comfortable with. I still prefer machine language for the kind of programming I do, but there's a valid need for Pascal on microcomputers.

Oxford Computer Systems (Software) Ltd.
Hensington Road, Woodstock Oxford
OX7 1 JR England
Distributed in the U.S by:
Limbic Systems, Inc.
560 San Antonio Road
Suite 202
Palo Alto, CA 94306
$49.95 (disk)

At press time, we learned that Commodore announced a discontinuation of the MCS-801 color dot-matrix printer, which was covered in this column last month. It appears that dealers never received it. ■

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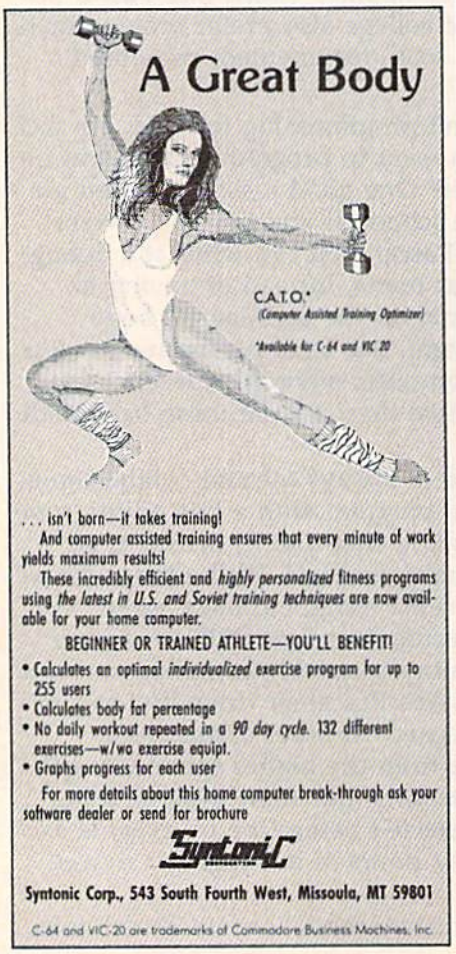

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Dan Carmichael, Assistant Editor

Simulating Hi-Res Animation

Part 2

Last month we reviewed the basics of creating custom characters. This month we'll show you how to simulate high-resolution animation using them.

When using custom characters to animate in the normal fashion, action can be jumpy. This is because characters are usually moved one screen position, eight pixels, at a time. To illustrate this, enter and RUN the program below. You'll see a vertical bar (a custom character) move across the screen. (Note: All programming examples in this article should be used with an unexpanded VIC.)

```
5 PRINT"{CLR} PLEASE WAIT...":A=7168:B=76
  79:S=7680:C=38400:CE=38911:SE=8191
                                    :rem 117
10 FORX=ATOB:POKEX,0:NEXT:FORX=CTOCE:POKE
   X,6:NEXT                         :rem 89
20 READB:IFB=999THEN50              :rem 71
30 POKEA,B:A=A+1:GOTO20             :rem 107
50 POKE36869,255                    :rem 108
70 POKES,0:FORA=STOSE:POKEA,0:POKEA-1,32:
   FORT=1TO50:NEXTT:NEXTA           :rem 131
100 POKE36869,240                   :rem 146
63010 DATA128,128,128,128,128,128,128,128
                                    :rem 32
63090 DATA 999                      :rem 199
```

The secret of smooth animation is to move the character one row of pixels at a time. To see how this is done, enter and RUN this program, which moves the same vertical bar across the screen, but with one pixel increments. Notice how much smoother the animation is.

```
5 PRINT"{CLR} PLEASE WAIT...":A=7168:B=76
  79:S=7680:C=38400:CE=38911:SE=8191
                                    :rem 117
10 FORX=ATOB:POKEX,0:NEXT:FORX=CTOCE:POKE
   X,6:NEXT                         :rem 89
20 READB:IFB=999THEN50              :rem 71
30 POKEA,B:A=A+1:GOTO20             :rem 107
50 POKE36869,255                    :rem 108
200 PRINT"{HOME}{11 SPACES}"        :rem 118
210 FORA=STOSE:FORB=0TO7:POKEA,B:FORT=1TO
    10:NEXTT:NEXTB:POKEA,32:NEXTA:rem 172
500 POKE36869,240                   :rem 150
1000 DATA128,128,128,128,128,128,128,128
                                    :rem 231
2000 DATA64,64,064,064,064,064,064,064
                                    :rem 128
2010 DATA32,32,032,032,032,032,032,032
                                    :rem 89
2030 DATA16,16,016,016,016,016,016,016
                                    :rem 107
```

Figure 1

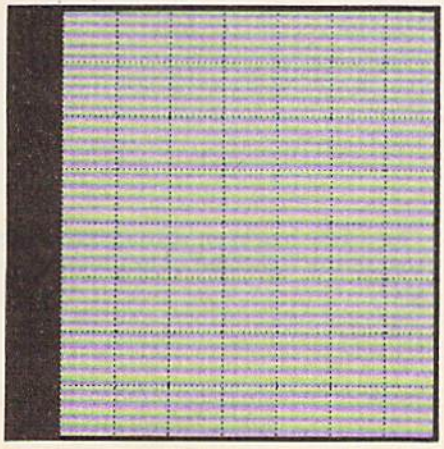


Figure 2

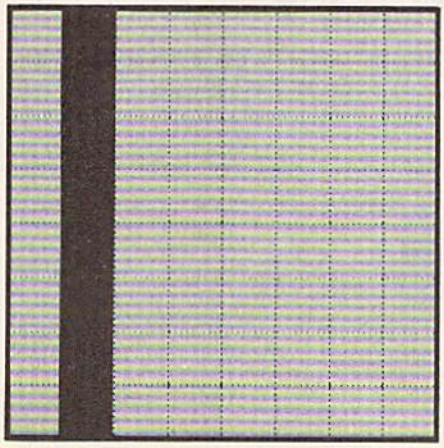
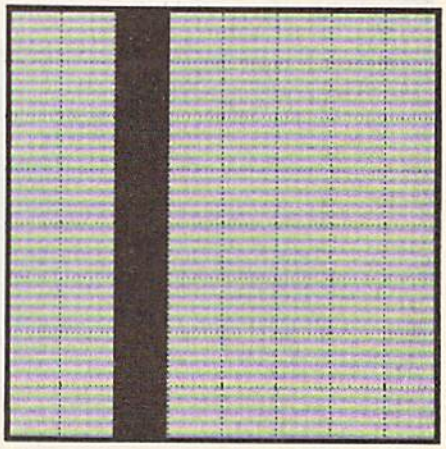


Figure 3



The vertical bar has been shifted to the right in each character. Shaded areas indicate pixels that are turned on.

Figure 4

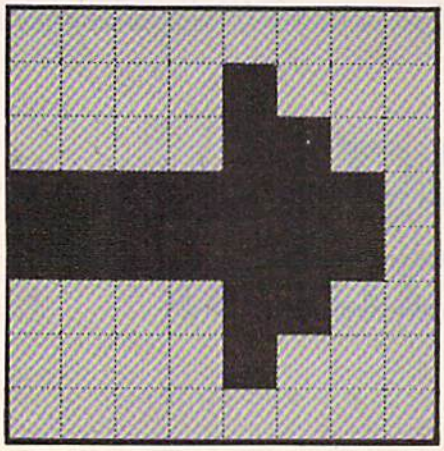
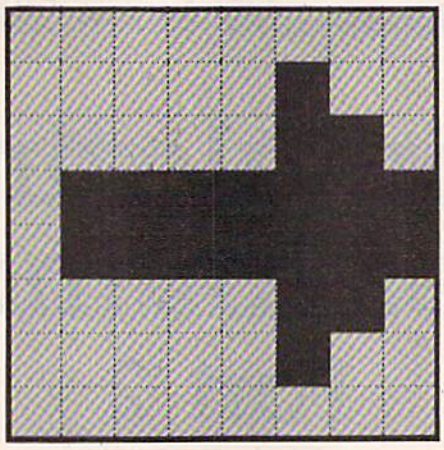


Figure 5



In Figure 4, the arrow starts the animation cycle.

In Figure 5, the arrow has been shifted one row of pixels to the right.

```
2040 DATA8,008,008,008,008,008,008,008
                                    :rem 116
2050 DATA4,004,004,004,004,004,004,004
                                    :rem 85
2060 DATA2,002,002,002,002,002,002,002
                                    :rem 70
2070 DATA1,001,001,001,001,001,001,001
                                    :rem 63
2080 DATA 999                      :rem 143
```

Shifting Custom Characters

To simulate smooth animation, you need to design more than one custom character. Each one will have to be shifted one row of pixels within its 8 × 8 grid. As an example, take a look at Figures 1–3. These are three of the eight custom characters necessary to smoothly animate the vertical bar. Notice how the vertical bar has been shifted one row of pixels to the right in each successive character. This shifting continues through all eight characters, with the eighth character having the vertical bar all the way to the right.

In the case of the vertical bar, animation is done by POKEing the first eight characters to the same screen position in succession. As each character is POKEd to the screen, it appears that the vertical bar is shifting one row of pixels to the right. To move the vertical bar to the next screen position, a repeat of the first custom character is POKEd to the next successive space on the screen, and a blank space is POKEd to the previous one. This process is repeated, moving the vertical bar across the screen.

Animating Large Custom Characters

Animating the vertical bar is easy because of the size (width) of the character. One complete cycle (eight POKEs) of animation could be done within the confines of one screen position. Only eight custom characters had to be designed to perform the animation.

But what do you do if the characters are bigger and can't be moved a complete animation cycle within one screen position? Two screen positions must be used, and as many as 16 custom characters have to be designed for the animation

Figure 6

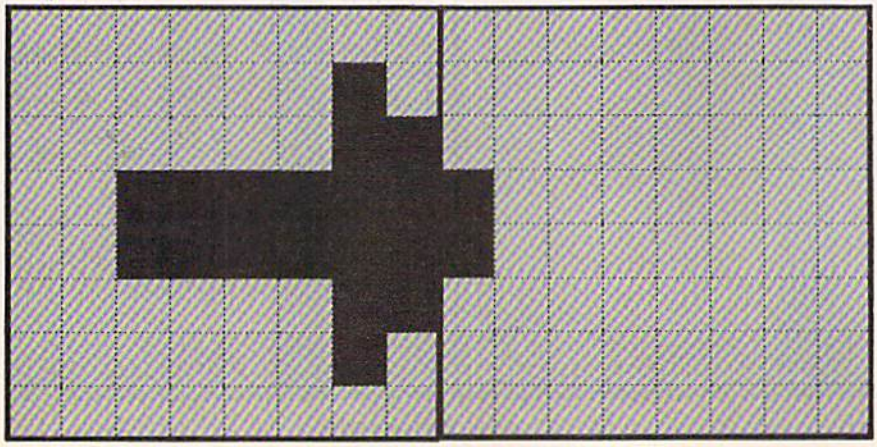
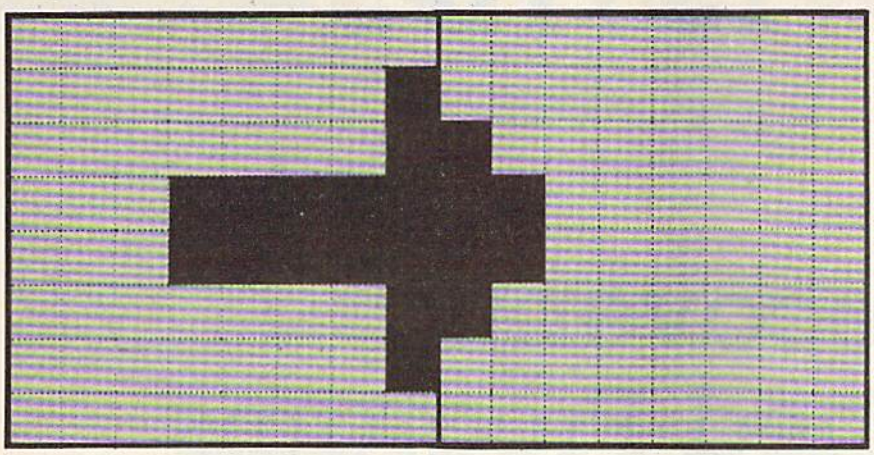


Figure 7

The arrow has been shifted one more row to the right and onto the next grid.

Figure 8 **Figure 9**



The animation cycle continues as the arrow moves even further into the adjacent grid.

effect. Enter and RUN this program, which will move an arrow smoothly across the screen.

```
10 PRINT"{CLR} PLEASE WAIT...":B=7168:S=7
   680:SE=8191:Z=999:M=7168:N=7679 :rem 6
12 C=38400:CE=38911                :rem 231
15 FORA=MTON:POKEA,0:NEXT:FORX=CTOCE:POKE
   X,6:NEXT                        :rem 72
20 READX:IFX=ZTHEN50               :rem 34
30 POKEB,X:B=B+1:GOTO20            :rem 132
50 POKE36869,255:PRINT"{HOME}{12 SPACES}"
                                   :rem 138
60 POKES,0:POKES,1                 :rem 93
70 FORA=2TO13STEP2:POKES,A:POKES+1,A+1:NE
   XT                              :rem 246
80 POKES,32:S=S+1:IFS=>8191THENPOKE36869,
   240:END                         :rem 159
90 GOTO60                          :rem 8
63000 DATA0,008,012,254,254,012,008,000
                                   :rem 147
63001 DATA0,004,006,127,127,006,004,000
                                   :rem 144
63002 DATA0,002,003,063,063,003,002,000
                                   :rem 133
63003 DATA0,000,000,128,128,000,000,000
                                   :rem 128
63004 DATA0,001,001,031,031,001,001,000
                                   :rem 119
63005 DATA0,000,128,192,192,128,000,000
                                   :rem 154
63006 DATA0,000,000,015,015,000,000,000
                                   :rem 121
63007 DATA0,128,192,224,224,192,128,000
                                   :rem 172
63008 DATA0,000,000,007,007,000,000,000
                                   :rem 125
63009 DATA0,064,096,240,240,096,064,000
                                   :rem 174
63010 DATA0,000,000,003,003,000,000,000
                                   :rem 110
63011 DATA0,032,048,248,248,048,032,000
                                   :rem 167
63012 DATA0,000,000,001,001,000,000,000
                                   :rem 108
63013 DATA0,016,024,252,252,024,016,000
                                   :rem 151
63020 DATA 999                     :rem 192
```

The arrow is seven pixels wide. Because of this width, animation is accomplished by moving the arrow from one custom character grid to the next. See Figures 4–9.

In Figure 4, the arrow is contained within one custom character grid. In Figure 5, it's still within one grid, but, as with the vertical bar, it's been shifted one row to the right. Figures 6 and 7 depict two different custom characters side-by-side. As you can see, the arrow is again shifted one pixel row to the right. However, to do this we've moved it onto the next custom character grid. Figures 8 and 9 continue the process, with the arrow being shifted one more row to the right, further onto the next grid. This process continues until the arrow is completely within the grid on the right, and the cycle begins again.

As you can see, moving the arrow one pixel at a time necessitates moving part of it into the next screen position. In some cases, as many as two custom characters may be needed to create one arrow. Your custom characters will have to be designed with this in mind, and in some cases one character will have to be designed using two grids simultaneously. And if you want to move a character smoothly up, down, left, and right, you may need to combine four different custom characters.

Speed and Fine Animation

One drawback to simulating hi-res animation is speed. Because so many custom characters are involved, animation is sometimes sluggish. There are ways, however, to speed up the movement. One thing you can do is PRINT the custom characters, rather than POKEing them to screen memory. Printing is usually faster (you'll have to remember which characters you redefined if you use this method). Or try moving the characters two rows of pixels at a time instead of one. This will not only increase the speed, but will also reduce the number of custom characters needed, and the amount of memory used.

Recovering Scratched Programs

Daryl Biberdorf

If you've discovered a clever timesaving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s GAZETTE. *If we use it, we'll pay you $35. Due to the volume of items submitted, we regret that we cannot always reply individually to submissions.*

Perhaps you loaded a program you've been working on, made a few changes, and decided to save it. But first you got the disk directory (LOAD "$",8) and scratched the old version (OPEN 15,8,15, "S0:oldname": CLOSE15). Then it hits you. The newest version of the program has been destroyed, overwritten by the directory. And you don't have the older version, you just scratched it.

What do you do when you've scratched the only copy of a program you were working on?

There are utility programs which allow you to go in and restore or unscratch a scratched program. Even if you have such a program, you might want to try something faster and easier.

Loading A Scratched Program

When you scratch an important program, don't turn off your computer or disk drive. Try this technique for rescuing your program.

First, check the directory: LOAD "$",8 followed by LIST. If you used the wrong filename or incorrectly opened the command channel, your program may still be there. But chances are, you did not make a mistake. The file is gone.

Now type LOAD "*",8 and LIST. You should see the program you thought you just scratched. Before you do anything else, save the program.

This trick may not always work, depending on what you did before and after scratching the file. Your disk drive has a built-in microprocessor which performs the usual functions of loading, saving, and updating the directory. But it also remembers which program was the last to be accessed. When you enter LOAD "*",8 the computer looks for the previous program. It can even find a program which was just scratched, if it was the last program to be saved or loaded.

Scratching a file does not really erase it. It simply removes the program name from the directory and frees up some space on the disk for future SAVEs. If you scratch a file you just saved or loaded, it's still there and can be rescued with the asterisk. But if you've done something with another file, *it* becomes the previous program and this method will not work.

If you accidentally scratch a machine language file you were working on, you can recover it with LOAD "*",8,1 but to save it requires an ML monitor (and you have to know the starting and ending addresses).

NEWS & PRODUCTS

Dot Matrix Thermal Printer

The HUSH 80, an 80-column, 80 cps dot matrix thermal printer that retails for $159.99, has been introduced by Ergo Systems, Inc.

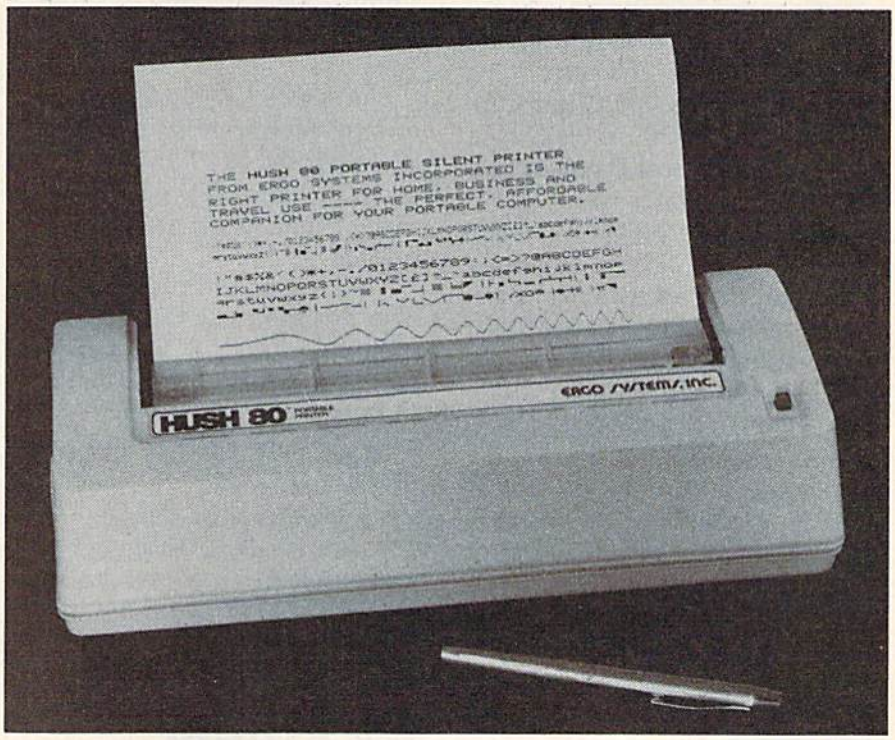
The HUSH 80 comes with interface and cable, and features bidirectional printing. Graphics are printed at 4,800 dots per square inch.

Three models are available, each of which can be equipped with a built-in rechargeable battery pack. The HUSH 80P version has a Centronics parallel interface, while the HUSH 80S provides a serial RS-232 interface.

The printer weighs 28 ounces, and measures 1.63 × 5.5 × 2.8 inches. The unit was manufactured to fit within a standard briefcase. The print line can be set for double size characters at 40 per line, or half-size characters at 160 per line. Line spacing can be programmed to 4.5, 6, or 9 lines to the inch.

All HUSH 80 models typically include the interface, interface cable, 100-foot roll of thermal paper, and a nine-volt AC wall transformer with power cable.

Ergo Systems, Inc.
1360 Willow Road
Menlo Park, CA 94025
(415) 322-3746



The HUSH 80, a bidirectional dot matrix thermal printer from Ergo Systems, Inc., retails for $159.99.

VIC, 64 Graphics Tablet

Personal Peripherals, Inc. has introduced Super Sketch, a graphics tablet for use with the VIC-20 and Commodore 64. Software that expands the capabilities of the tablets is also available.

Sketch-Master, the VIC version, allows the user to create simple line art with a number of computer automated graphics capabilities. Graphics-Master, for the 64, provides all Sketch-Master features, plus a number of advanced capabilities and more sophisticated menu selections.

Included with each version of Super Sketch is a software cartridge and a starter kit of drawings that can be traced from the pad.

Suggested retail price for each version is $59.95.

Personal Peripherals, Inc.
Merrick Park
930 North Beltline Road
Suite 120
Irving, TX 75061
(214) 790-1440

Terminal Software For 64

Madison Computer has introduced *McTerm 64*, a terminal program for the Commodore 64.

Features include an on-screen clock, word wrap, greater than 24K buffer, and auto linefeed options. Baud rate can be set at either 300 or 1,200. The program can be preset to send files at a later time.

Depending on the type of modem used, *McTerm 64* can store and dial up to ten phone numbers, and can automatically answer the phone.

McTerm 64, available on disk, retails for $49.95.

Madison Computer
1825 Monroe
Madison, WI 53711
(608) 255-5552

Games, Education, Home Applications Software For C-64, VIC-20

PandaSoft has announced a number of game, educational, and home applications software for the Commodore 64 and VIC-20.

Disk games for the 64 include: *Pro Golf Challenge* ($25.95), a golf graphics game; *Legend of Starship Terra* ($14.95), a futuristic adventure; and *Revenge of the Phoenix/Time Storm* ($19.95), a graphics arcade and logic program.

Under educational titles, PandaSoft offers *USA Math Star* ($19.95), which teaches addition, subtraction, multiplication, and division; *History 1 & 2* and *Authors* ($12.95 each), two quiz games; *Weights 2 in 1* ($9.98), which teaches both metric and English weights; and *Missing Letter* ($9.98), a word and letter quiz.

Kilowatt Miser ($9.98), an energy saving utility program, *The Budgeter* ($19.95), a budget program, and *M.D.B.* ($39.95), a master data base, are also offered.

Many of the programs are also available for the VIC-20, including *Kilowatt Miser* ($9.95 disk, $5.95 cassette). *General Catalog* ($9.95 disk, $5.95 cassette), a data base, is also available for the VIC.

PandaSoft Computer Software
2732 Rozzelle Ferry Road
P.O. Box 7647
Charlotte, NC 28217
(704) 394-8796

64 Printer Interface

Turboprint/GT, a graphic and text serial-to-parallel printer interface for the 64 has been introduced by Telesys.

The interface prints enhanced Commodore graphics, including reverse characters, and has a line buffer which doubles text printing speed on printers without on-board memory.

An optional Turboprint/B16 or B32 plug-in printer buffer is also available.

Retail price for the interface is $99.95. The 16K buffer retails for $99.95, the 32K buffer for $129.95.

Telesys
43334 Bryant Street
Fremont, CA 94539
(415) 651-2970
(800) 252-4733

VIC, 64 Weather Forecasting

Viasala Inc. has introduced *HAWS*, a software package that helps VIC-20 and Commodore 64 owners forecast the weather.

The *HAWS* (*Home Automatic Weather Station*) package includes weather sensors, plus a software program on either cassette or disk.

The weather sensor comes with a cable which plugs into the user port of the VIC or 64.

HAWS can collect data, graphically display weather trends, and output collected data to standard printers. The data gathered by the *HAWS* sensor can also be used within user-written programs.

HAWS retails for $199.95.

Viasala Inc.
2 Tower Office Park
Woburn, MA 01801
(617) 933-4500

COMPUTE!'s GAZETTE *welcomes announcements of new products for VIC-20 and Commodore 64 computers, especially products aimed at beginning to intermediate users. Please send press releases and photos well in advance to: Tony Roberts, Assistant Managing Editor,* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

New product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication. ●

A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in COMPUTE!'s GAZETTE for Commodore are written in a computer language called BASIC. BASIC is easy to learn and is built into all VIC-20s and Commodore 64s.

BASIC Programs

Each month, COMPUTE!'s GAZETTE for Commodore publishes programs for both the VIC and 64. To start out, type in only programs written for your machine, e.g., "VIC Version" if you have a VIC-20. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from another computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as O for the numeral 0, a lowercase l for the numeral 1, or an uppercase B for the numeral 8. Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Braces And Special Characters

The exception to this typing rule is when you see the braces, such as "{DOWN}". Anything within a set of braces is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to "How To Type In *COMPUTE!'s GAZETTE* Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard and STOP key may seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, *so always SAVE a copy of your program before you RUN it*. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1. Type in the program a line at a time, in order. Press RETURN at the end of each line. Use backspace or the back arrow to correct mistakes.
2. Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.
3. Make sure you've entered statements in braces as the appropriate control key (see "How To Type *COMPUTE!'s GAZETTE* Programs" elsewhere in the magazine).

We regret that we are not able to respond to individual inquiries about programs, products, or services appearing in COMPUTE!'s GAZETTE *for Commodore due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear in the magazine, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!'s GAZETTE *for Commodore, please send them to Gazette Feedback, P.O. Box 5406, Greensboro, NC 27403.*

How To Type In COMPUTE!'s GAZETTE Programs

Many of the programs which are listed in COMPUTE!'s GAZETTE contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to know exactly what to type when entering one of these programs into your computer, we have established the following listing conventions.

Generally, any VIC-20 or Commodore 64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, [key], you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Rarely, you'll see a solitary letter of the alphabet enclosed in braces. These characters can be entered on the Commodore 64 by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A. You should never have to enter such a character on the VIC-20, but if you do, you would have to leave the quote mode (press RETURN and cursor back up to the position where the control character should go), press CTRL-9 (RVS ON), the letter in braces, and then CTRL-0 (RVS OFF).

About the *quote mode*: You know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following table when entering cursor and color control keys:

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + CRSR ↑	
{DOWN}	CRSR ↓	
{LEFT}	SHIFT + CRSR ←	
{RIGHT}	CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{1}	C= + 1	
{2}	C= + 2	
{3}	C= + 3	
{4}	C= + 4	
{5}	C= + 5	
{6}	C= + 6	
{7}	C= + 7	
{8}	C= + 8	
{F1}	f1	
{F2}	SHIFT + f1	
{F3}	f3	
{F4}	SHIFT + f3	
{F5}	f5	
{F6}	SHIFT + f5	
{F7}	f7	
{F8}	SHIFT + f7	

The Automatic Proofreader

"The Automatic Proofreader" will help you type in program listings from COMPUTE!'s Gazette without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after typing a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs in COMPUTE!'s Gazette.

Preparing The Proofreader

1. Using the listing below, type in the Proofreader. The same program works on both the VIC-20 and Commodore 64. Be very careful when entering the DATA statements — don't type an l instead of a 1, an O instead of a 0, extra commas, etc.

2. SAVE the Proofreader on tape or disk at least twice *before running it for the first time*. This is very important because the Proofreader erases this part of itself when you first type RUN.

3. After the Proofreader is SAVEd, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and SAVE the corrected version. Keep a copy in a safe place — you'll need it again and again, every time you enter a program from COMPUTE!'s Gazette.

4. When a correct version of the Proofreader is RUN, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP-RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using The Proofreader

All VIC and 64 listings in COMPUTE!'s Gazette now have a *checksum number* appended to the end of each line, for example ":rem 123". *Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently than the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're done typing a listing, you must disable the Proofreader before SAVEing the program on tape. Disable the Proofreader by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

SAVE to tape erases the Proofreader from memory, so you'll have to LOAD and RUN it again if you want to type another listing. SAVE to disk does not erase the Proofreader.

Since the Proofreader is a machine language program stored in the cassette buffer, it will be erased during a tape SAVE or LOAD. If you intend to type in a program in more than one sitting or wish to make a safety SAVE, follow this procedure:

1. LOAD and RUN the Proofreader.
2. Disable it by pressing RUN/STOP–RESTORE.
3. Type the following three lines in direct mode (without line numbers):

```
A$="PROOFREADER.T":B$="{10 SPACES}":FO
RX=1TO4:A$=A$+B$:NEXTX
FORX=886 TO 1018:A$=A$+CHR$(PEEK(X)):N
EXTX
OPEN1,1,1,A$:CLOSE1
```

After you type the last line, you will be asked to press RECORD and PLAY. We recommend you start at the beginning of a new tape.

You now have a new version of the Proofreader (PROOFREADER.T, as renamed in the above code). Turn your computer off and on, then LOAD the program you were working on. Put the cassette containing PROOFREADER.T into the tape unit and type:

```
OPEN1:CLOSE1
```

You can now get into the Proofreader by typing SYS 886. To test this, PRINT PEEK (886) should return the number 173. If it does not, repeat the steps above, making sure that A$ (PROOFREADER.T) contains 13 characters and that B$ contains 10 spaces.

The new version of Automatic Proofreader will load itself into the cassette buffer whenever you type OPEN1:CLOSE1 and PROOFREADER.T is the next program on your tape. It will not disturb the contents of BASIC memory.

Automatic Proofreader For VIC And 64

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Bug-Swatter:
Modifications And Corrections

• Program 2, "Change Disk ID," from "Disk Tricks" (September) changes the disk ID in the directory header, but does not actually change the ID on individual disk tracks and sectors. This program was intended to solve the problem of duplicate disk IDs, as explained in the article. It does *not* solve this problem.

When a disk is formatted with the *N0:* (new) command, the disk ID is written on every sector of every track. In addition, a directory header with the disk name and ID is created. When a file is accessed, the disk operating system (DOS) gets its information from the individual sectors, not from the header. The Change Disk ID program changes only the header. Writing to individual tracks and sectors (to actually change the ID) would require reprogramming the disk drive.

If you have disks with duplicate IDs, you can eliminate the problems by either 1) copying all important files to a separate disk and then reformatting the problem disk with a unique ID, or 2) initializing the disk, with the *I0:* command, every time you swap disks.

Since the program makes a cosmetic change to the directory, it does not destroy any data on the disk, and subsequent READ/WRITE operations should work without problems.

Readers who have used the Change Disk ID program can discover the original ID with this short program:

```
10 T=18:S=0:REM TRACK AND SECTOR
20 OPEN2,8,2,"#":OPEN15,8,15
30 PRINT#15,"I0"
40 PRINT#15,"U1";2;0;T;S
50 FORJ=22TO23:PRINT#15,"M-R";CHR$(J);CHR
   $(0):GET#15,Z$:AD$=AD$+Z$:NEXT
60 CLOSE15:CLOSE2
70 PRINT"ID=";AD$
```

This program reads the true ID from track 18, sector 0. After discovering the true ID, you can use the Change Disk ID program to change the ID back to what it should be.

• When the program listing for "Treasure Hunt/64" (September) was made, line 655 was garbled. In addition, line 836 was accidentally omitted. Here are the corrections:

```
655 POKETL,32:POKETL+Q,32:POKECL,46:POKEC
    L+Q,47:POKECL+CM,4:POKECL+CM+Q,4
                                  :rem 81
836 PRINT"APPROACH.{31 SPACES}";  :rem 41
```

• "Screen-80" (September) works as listed, but the information about using sprites contains an error. Screen memory (normally at 1024–2023) is followed by the eight sprite pointers (normally at 2040–2047, or beginning of screen memory plus 1016). Screen-80 uses a high-resolution screen and moves the equivalent of screen memory to 53248, which means the sprite pointers move to 53248+1016, not 53248+2040 as stated in the article. Line 60 of the sprite program on page 50 should be changed accordingly:

```
60 POKE 53248+1016,0              :rem 234
```

• Readers Joseph Maniscalco and Amir Findling have informed us that although the 64 version of "Balloon Blitz" (August) runs without errors, it has a slight glitch in the joystick reading routine. Pushing the joystick to the southeast (down and right) will cause a bomb to be dropped. Changing line 14 to

```
14 IF A>=117 THEN GO TO 3
```

will fix the problem.

• The VIC version of "3-D Tic-Tac-Toe" (June) contains some color codes accessible on the 64 but not on the VIC. This happened when the game was translated and does not adversely affect the program, although the Automatic Proofreader checksums will be incorrect. In lines 300, 320, and 590, rather than pressing the Commodore key and one of the numbered (color) keys, VIC users should press CTRL and the indicated color key.

• "Props" (May) runs as listed, but some readers have encountered an error message for lines 49000 to 49308. This is due to line 49151 where variable CJ is set to zero and then a different variable (CK) is used as a checksum. If line 49151 is entered as listed, the error message should not occur.

• Levitating in the VIC version of "Castle Dungeon" requires pressing the L key. Reader Michael Bank thinks it is more convenient to use the joystick button and suggests the following modification:

```
26 BN= PEEK(37137)AND32: IF BN=0 THEN LS=1:
   GOSUB82
```

SpeedScript Update:

• The VIC version of *SpeedScript* included on the May GAZETTE DISK scrambles the first five

characters of all files. Reader Jon Harmon has discovered that text memory and a few bytes at the end of program memory overlap. To fix this, follow these steps: First, load (but do not run) VICSPEEDSCRIPT from the May GAZETTE DISK. Next, POKE 4627,16: POKE 4989,21 and save the new version to disk. The problem should be solved.

• The July "Bug-Swatter" reported on hardware incompatibilities between the VIC-20, Datassette, and the Commodore 1526 printer. The solution (SYS 64490 after cassette operations) has been incorporated into the *original* (January) VIC version of *SpeedScript* by Reader Brian Mason. First, load (but do not run) the original VIC version. Next, POKE 8560,234: POKE 8561, 215: POKE 8562,96 and save the new version. This replaces the disk access command (Control/up arrow) with the appropriate SYS. VIC tape users should hold down the CTRL key and press the up arrow key, after VIC *SpeedScript* tape saves or loads. The serial bus will become available for use with a 1526. The equivalent POKEs for the May GAZETTE DISK version are 8572–8574, although the problem with 1526 printers does not occur with disk drives.

• Several readers who own a portable SX-64 have indicated that *SpeedScript* disk access—LOADs, SAVEs, and directories—can cause the computer to lock up. Because *SpeedScript* uses a raster interrupt to form the window at the top of the screen, the interrupt registers have to be reset before disk or printer operations.

Rodney L. Barnes disassembled the program and discovered that before disk operations, *SpeedScript* stores a 255 ($FF), the usual value on a Commodore 64, in the CIA interrupt register at 56333 ($DC0D). Bit 4 of this register enables tape operations. Because the SX-64 has no Datassette port and no provisions for tape use, storing this value in the CIA register can cause extraneous interrupts, interfering with the serial I/O. To fix this, load (but don't run) the January version of *SpeedScript* into your SX-64, POKE 4714, 239 (if you have the May GAZETTE DISK Version, POKE 4789,239), and then save the new version to disk.

Readers should note this modification applies only to the portable SX-64, not the Commodore 64.

• "SpeedScript Revisited" (May) included a modification to allow printing to an RS-232 printer. The modification applied only to the VIC version of *SpeedScript*. Readers Clifford Jensen, Lee Folgedalen, and Robert Latham have adapted the 64 version for use with such printers. First, load (but don't run) *SpeedScript*. Then, if you have the January version, POKE 5262,2 (for the May GAZETTE DISK version, POKE 5337,2) and save the new program to tape or disk.

Before running *SpeedScript*, POKE 660,0 and POKE 659,6 (Baud rate of 300) or POKE 659,3 (Baud rate of 110). Put an [a] (press CTRL-£ then "a" and you'll see a reverse "a") at the top of the file, and to print, press SHIFT-CTRL-P followed by a 2 (device 2) then another 2 (secondary address 2).

• Several readers have inquired about a Spelling Checker program for *SpeedScript*. Such a program is not feasible, because it would require users to type in hundreds, if not thousands, of words from a dictionary. However, Robert Murray has found that the commercial program *SpellRight Plus* for the 64 from Professional Software, designed for use with WordPro3+/64, also works with *SpeedScript*. He suggests removing all formatting commands (reverse-video characters)—header, footer, spacing, and others—before running the program.

We appreciate receiving both corrections and suggested modifications from readers. Address them to:

Bug-Swatter
c/o COMPUTE!'s GAZETTE
P.O. Box 5406
Greensboro, NC 27403

Please indicate the type of error you have found, as well as the line number.

The Tomb

(Article on page 58.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: The Tomb (VIC Version)

```
0 PRINT"{CLR}":POKE36879,10:GOTO3000:PH=0
  :SC=0:S=7680                        :rem 236
1 GOSUB2000:S=7680:C=38400:DX=1:DY=1:EX(1
  )=10:EX(2)=13:EX(3)=2               :rem 16
2 Q=22:EY(1)=11:EY(2)=10:EY(3)=17:POKE816
  2,32:POKE8139,32:POKE7726,32        :rem 129
3 POKES+Q*DY+DX,33:POKEC+Q*DY+DX,4
                                      :rem 103
4 FORZ=1TO3:POKES+Q*EY(Z)+EX(Z),36:POKEC+
  Q*EY(Z)+EX(Z),5:NEXT                :rem 84
```

```
5 POKE8185,37:POKE38905,7                :rem 165
11 TR=500                                :rem 218
12 POKE36878,15                          :rem 52
18 POKE36875,140:FOR Z=1TO25:NEXT:rem 210
19 POKE36875,0                           :rem 2
20 POKE37154,127:P=PEEK(37152)AND128:J0=-
   (P=0):POKE37154,255                   :rem 105
21 P=PEEK(37151):J1=-((PAND8)=0):J2=-((PA
   ND16)=0):J3=-((PAND4)=0)              :rem 48
22 CX=J0-J2:CY=J1-J3                     :rem 151
23 IFCX=0ANDCY=0THEN80                   :rem 111
24 IFPEEK(S+Q*(DY+CY)+(DX+CX))=35THEN80
                                         :rem 51
25 POKES+Q*DY+DX,32:DX=DX+CX:DY=DY+CY:IFP
   EEK(S+Q*DY+DX)=36THEN4000             :rem 166
28 POKEC+Q*DY+DX,4:POKES+Q*DY+DX,33
                                         :rem 158
29 IFS+Q*DY+DX=8185THEN5000              :rem 94
79 IFINT(RND(1)*3)=1THEN18               :rem 4
80 B=INT(RND(1)*3)+1:CX(B)=0:CY(B)=0:W=0
                                         :rem 235
81 POKES+Q*EY(B)+EX(B),32:CX(B)=((EX(B)>D
   X)-(EX(B)<DX))                        :rem 133
82 EX(B)=EX(B)+CX(B)                     :rem 96
85 CY(B)=((EY(B)>DY)-(EY(B)<DY))         :rem 15
86 IFPEEK(S+Q*EY(B)+EX(B)+Q*CY(B))=35THEN
   CY(B)=0:EX(B)=EX(B)-CX(B)             :rem 111
87 EY(B)=EY(B)+CY(B)                     :rem 104
88 IFPEEK(S+Q*EY(B)+EX(B))=33THEN4000
                                         :rem 144
89 POKES+Q*EY(B)+EX(B),36:POKEC+Q*EY(B)+E
   X(B),5:TR=TR-1:GOTO18                 :rem 246
91 GOTO18                                :rem 12
299 CX(B)=0:CY(B)=0                      :rem 21
1999 END                                 :rem 179
2000 FORM=7702TO8163                     :rem 120
2001 IFINT(RND(1)*3)=1 ANDPEEK(M-1)<>35TH
     EN2004                              :rem 138
2002 NEXT                                :rem 3
2003 RETURN                              :rem 165
2004 POKEM+30720,2:POKEM,35:NEXT         :rem 138
2999 RETURN                              :rem 189
3000 POKE56,28:POKE52,28:POKE51,PEEK(55):
     CLR:PRINT"{3 DOWN}{RVS}";:PRINTTAB(6
     )"REDEFINING"                       :rem 30
3001 CS=256*PEEK(52)+PEEK(51):FORI=CSTOCS
     +511:POKEI,PEEK(I+32768-CS):NEXT
                                         :rem 136
3002 FORI=7432TO7439:READJ:POKEI,J:NEXT
                                         :rem 189
3003 DATA60,60,24,255,60,60,102,102
                                         :rem 212
3004 FORI=7448TO7455:READJ:POKEI,J:NEXT
                                         :rem 196
3005 DATA255,255,255,255,255,255,255,255
                                         :rem 246
3006 FORI=7456TO7463:READJ:POKEI,J:NEXT
                                         :rem 196
3007 DATA129,153,102,60,255,60,66,66
                                         :rem 32
3008 FORI=7464TO7471:READJ:POKEI,J:NEXT:P
     RINT"{CLR}"                         :rem 98
3009 DATA0,0,126,126,126,126,0,0         :rem 62
3010 CLR:POKE36869,255                   :rem 230
3011 FORC=7680TO7701:POKEC+30720,2:POKEC,
     35:POKEC+31204,2:POKEC+484,35:NEXT
                                         :rem 151
3012 FORC=7680TO8164STEP22:POKEC+30720,2:
     POKEC,35:POKEC+30741,2:POKEC+21,35:N
     EXT                                 :rem 4
3111 GOTO 1                              :rem 48
4000 POKE 36878,15:POKE36876,200:FORL1=25
     0 TO 150STEP-17                     :rem 70
4001 POKE36875,L1:FORL2=150TO190:POKE3687
     6,L2:NEXTL2,L1                      :rem 26
4002 POKE36875,0:POKE36876,0             :rem 49
4003 PRINT"{HOME}{WHT}{DOWN}{2 SPACES}THE
      GUARDIAN HAS{9 SPACES}CAUGHT YOU."
                                         :rem 176
4004 PRINTTAB(8)"{2 DOWN}{YEL}GOLD={BLU}"
     SC                                  :rem 209
4005 PRINT"{DOWN}{CYN}HIT THE TRIGGER IF
     {SPACE}YOU{2 SPACES}DARE TO TRY AGAI
     N."                                 :rem 252
4006 PRINT"{DOWN}{CYN}TYPE (Q) IF YOU WIS
     H{9 SPACES}TO QUIT."                :rem 10
4007 GETA$:P=PEEK(37137):IF A$="Q"THENPOK
     E251,0:SYS251                       :rem 117
4008 IF-((PAND32)=0)<>1THEN4007          :rem 196
4009 IF SC>PH THEN PH=SC                 :rem 98
4010 PRINT"{CLR}":SC=0:GOTO3011          :rem 158
5000 PRINT"{HOME}{WHT}YOU GRAB THE TREASU
     RE"                                 :rem 19
5001 FORZ=1TO100:POKE36876,INT(RND(1)*128
     )+128                               :rem 121
5002 FORHG=1TO10:NEXT:NEXT:POKE36876,0
                                         :rem 116
5100 PRINT"{CLR}{5 DOWN}":PRINT"{5 RIGHT}
     {BLU}{2 SPACES}GOLD={YEL}"SC;:PRINT"
      "                                  :rem 23
5101 FORL=1TOTR:SC=SC+1:PRINT"{UP}
     {12 RIGHT}"SC:NEXT                  :rem 183
5120 PRINT"{2 DOWN}{RED} MOST TREASURE RE
     COV-{2 SPACES}ERED FROM TOMB YET":PR
     INTTAB(8)"{YEL}"PH                  :rem 74
5121 PRINT"{DOWN}{PUR} PRESS Q TO QUIT NO
     W"                                  :rem 255
5122 PRINT:PRINT{2 SPACES}"{3 SPACES}HIT
     {SPACE}THE TRIGGER{9 SPACES}TO CONTI
     NUE"                                :rem 68
5123 P=PEEK(37137):IF -((PAND32)=0)=1THEN
      PRINT"{CLR}":GOTO 3011             :rem 153
5124 IF PEEK(197)=48 THEN POKE251,0:SYS25
     1                                   :rem 62
5125 GOTO 5123                           :rem 209
```

Program 2: The Tomb (64 Version)

```
0 POKE56,28:CLR:PRINT"{CLR}":POKE53280,2:
  POKE53281,0:GOTO3000:PH=0:SC=0         :rem 92
1 GOSUB2000:C=55296:DX=1:DY=1:EX(1)=5:EX(
  2)=20:EX(3)=35                         :rem 133
2 Q=40:EY(1)=12:EY(2)=6:EY(3)=22:POKE1982
  ,32                                    :rem 183
3 POKE1024+Q*DY+DX,33:POKEC+Q*DY+DX,4
                                         :rem 219
4 FORZ=1TO3:POKE1024+Q*EY(Z)+EX(Z),36:POK
  EC+Q*EY(Z)+EX(Z),5:NEXT                :rem 200
5 POKE2023,37:POKE56295,7:S=1024         :rem 41
6 CL=54272:VL=CL+24:FORI=CLTOCL+24:POKEI,
  0:NEXT                                 :rem 191
11 TR=500                                :rem 218
18 POKEVL,15:POKECL+5,15:POKECL+6,129:FOR
    Z=1TO25:NEXT:POKEVL,0                :rem 170
20 X1=PEEK(56320):CY=-(((X1AND1)=1)+((X1A
   ND2)=2)*-1)                           :rem 30
21 CX=((X1AND8)=8)+((X1AND4)=4)*-1:rem 60
23 IFCX=0ANDCY=0THEN80                   :rem 111
24 IFPEEK(S+Q*(DY+CY)+(DX+CX))=35THEN80
                                         :rem 51
25 POKES+Q*DY+DX,32:DX=DX+CX:DY=DY+CY:IFP
```

```
   EEK(S+Q*DY+DX)=36THEN4000      :rem 166
28 POKEC+Q*DY+DX,4:POKES+Q*DY+DX,33
                                  :rem 158
29 IFS+Q*DY+DX=2023THEN5000       :rem 79
80 B=INT(RND(1)*3)+1:CX(B)=0:CY(B)=0:W=0
                                  :rem 235
81 POKES+Q*EY(B)+EX(B),32:CX(B)=((EX(B)>D
   X)-(EX(B)<DX))                 :rem 133
82 EX(B)=EX(B)+CX(B)              :rem 96
85 CY(B)=((EY(B)>DY)-(EY(B)<DY))  :rem 15
86 IFPEEK(S+Q*EY(B)+EX(B)+Q*CY(B))=35THEN
   CY(B)=0:EX(B)=EX(B)-CX(B)      :rem 111
87 EY(B)=EY(B)+CY(B)              :rem 104
88 IFPEEK(S+Q*EY(B)+EX(B))=33THEN4000
                                  :rem 144
89 POKES+Q*EY(B)+EX(B),36:POKEC+Q*EY(B)+E
   X(B),5:TR=TR-1:GOTO18          :rem 246
91 GOTO18                         :rem 12
299 CX(B)=0:CY(B)=0               :rem 21
1999 END                          :rem 179
2000 FORM=1064TO1983              :rem 118
2001 IF INT(RND(1)*3)=1ANDPEEK(M-1)<>35TH
     EN 2004                      :rem 138
2002 NEXT                          :rem 3
2003 RETURN                       :rem 165
2004 POKEM+54272,2:POKEM,35:NEXT  :rem 146
2999 RETURN                       :rem 189
3000 POKE56334,PEEK(56334)AND254:POKE1,PE
     EK(1)AND251:PRINT"{3 DOWN}{RVS}";
                                  :rem 111
3001 PRINTTAB(15)"REDEFINING{OFF}":FORI=0
     TO511:POKEI+12288,PEEK(I+53248):NEXT
     I                            :rem 97
3002 FORI=12552TO12559:READJ:POKEI,J:NEXT
                                  :rem 27
3003 DATA60,60,24,255,60,60,102,102
                                  :rem 212
3004 FORI=12568TO12575:READJ:POKEI,J:NEXT
                                  :rem 34
3005 DATA255,255,255,255,255,255,255,255
                                  :rem 246
3006 FORI=12576TO12583:READJ:POKEI,J:NEXT
                                  :rem 34
3007 DATA129,153,102,60,255,60,66,66
                                  :rem 32
3008 FORI=12584TO12591:READJ:POKEI,J:NEXT
     :PRINT"{CLR}"                :rem 192
3009 DATA0,0,126,126,126,126,0,0  :rem 62
3010 POKE1,PEEK(1)OR4:POKE56334,PEEK(5633
     4)OR1:POKE53272,PEEK(53272)AND240OR1
     2                            :rem 49
3011 FORC=1024TO1063:POKEC+54272,2:POKEC,
     35:POKEC+55232,2:POKEC+960,35:NEXT
                                  :rem 146
3012 FORC=1024TO1984STEP40:POKEC+54272,2:
     POKEC,35:POKEC+54311,2:POKEC+39,35
                                  :rem 144
3013 NEXT                          :rem 6
3111 GOTO 1                       :rem 48
4000 FORL2=1TO5:POKEVL,9:POKECL+5,72:POKE
     CL+6,241:FORL1=50TO25STEP-1  :rem 204
4001 POKE CL+1,L1:POKECL+4,33:NEXTL1:NEXT
     L2:POKECL+4,32               :rem 70
4003 PRINTTAB(6)"{WHT}{DOWN}THE GUARDIAN
     {SPACE}HAS CAUGHT YOU"       :rem 205
4004 PRINTTAB(17)"{2 DOWN}{YEL}GOLD={BLU}
     "SC                           :rem 1
4005 PRINT"{DOWN}{CYN}HIT THE TRIGGER IF
     {SPACE}YOU DARE TO TRY AGAIN"
                                  :rem 206
4006 PRINTTAB(6)"{DOWN}{CYN}TYPE (Q) IF Y
     OU WISH{2 SPACES}TO QUIT"    :rem 58
4007 GETA$:X1=PEEK(56320)AND16:IFA$="Q"TH
     ENPOKE53272,21:PRINT"{CLR}":END
                                  :rem 95
4009 IFX1<>0THEN 4007             :rem 137
4010 IF SC<>PH THEN PH=SC         :rem 150
4011 PRINT"{CLR}":SC=0:GOTO 3011  :rem 159
5000 PRINT:PRINTTAB(10)"{WHT}YOU GRAB THE
      TREASURE"                   :rem 80
5001 POKEVL,15:POKECL+5,71:POKECL+6,241:F
     ORZ=1TO100:POKECL+4,33       :rem 55
5002 POKECL+1,INT(RND(1)*128)+64:FORHG=1T
     O10:NEXT:NEXT:POKECL+4,32     :rem 5
5100 PRINT"{CLR}{5 DOWN}":PRINTTAB(14)"
     {BLU}{2 SPACES}GOLD={YEL}"SC;:PRINT"
      "                           :rem 19
5101 FORL=1TOTR:SC=SC+1:PRINTTAB(21)"{UP}
     "SC:NEXT                     :rem 230
5120 PRINT"{2 DOWN}{RED}{2 SPACES}MOST TR
     EASURE RECOVERED BEFORE=";:PRINTTAB(
     32)"{YEL}"PH                 :rem 29
5122 PRINTTAB(10)"{DOWN}{PUR} PRESS Q TO
     {SPACE}QUIT NOW"             :rem 137
5123 PRINT:PRINTTAB(7)"HIT THE TRIGGER TO
      CONTINUE"                   :rem 164
5124 GETA$:X1=PEEK(56320)AND16:IFX1=0 THE
     N PRINT"{CLR}":GOTO3011      :rem 75
5125 IF A$="Q"THEN POKE53272,21:PRINT"
     {CLR}":END                   :rem 50
5126 GOTO 5124                    :rem 211
```

Cabby

(Article on page 60.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Cabby (VIC Version)

```
5 POKE56,28:POKE55,0:POKE52,28:POKE51,0
                                  :rem 37
10 PRINT"{CLR}":POKE36879,104      :rem 0
20 PRINT"{7 DOWN}{4 RIGHT}{CYN}SETTING UP
   ":PRINT"{DOWN}{4 RIGHT}PLEASE WAIT!!!!
   "                              :rem 131
50 FORI=7168TO7679:POKEI,PEEK(I+25600):NE
   XTI                            :rem 175
55 FORI=1TO13:READZ:FORJ=ZTOZ+7:READK:POK
   EJ,K:NEXTJ,I                   :rem 35
60 POKE37139,0:DD=37154:PA=37137:PB=37152
                                  :rem 19
65 DIM F$(26),T%(4),B%(4)         :rem 170
66 FORI=1TO26:READF$(I):NEXTI      :rem 49
150 H=7680:C=30720:CH=28:B%(1)=8055:B%(2)
    =7914:B%(3)=8051:B%(4)=7730   :rem 222
160 DEFFNA(X)=INT(RND(1)*X)+1:DEFFNL(Q)=H
    +22*Y+X                       :rem 70
170 Y=7:X=6:T%(1)=FNL(Q):Y=18:T%(2)=FNL(Q
    ):Y=8:X=16:T%(3)=FNL(Q):Y=15:T%(4)=FN
    L(Q)                          :rem 237
180 PRINT"{CLR}{11 DOWN}{WHT}LEVEL 1-EASY
     TO 4-HARD"                   :rem 232
```

```
190 GETZ$:LV=VAL(Z$):IFZ$=""THEN190
                                    :rem 84
193 IFLV<1ORLV>4THEN190             :rem 185
195 POKE36869,255:POKE36879,107     :rem 228
200 PRINT"{CLR}":GOSUB3000          :rem 115
210 P%=H+45:POKEP%,CH:POKEP%+C,7    :rem 101
220 XF%=0:CF%=0:GS=1400:RU=1        :rem 62
300 GOSUB1000                       :rem 212
310 IFXF%=0ANDRND(1)>.6THENGOSUB2000
                                    :rem 159
320 GOSUB500:IFSG=1THENSG=0:GOTO340
                                    :rem 187
330 IFRND(1)>.98THENGOSUB7000       :rem 222
340 GOSUB500:SG=0                   :rem 237
350 GOSUB5000                       :rem 221
360 GOSUB500:SG=0                   :rem 239
390 GOTO300                         :rem 104
500 POKEDD,127:S3=-((PEEK(PB)AND128)=0):P
    OKEDD,255                       :rem 122
510 P=PEEK(PA):S1=-((PAND8)=0):S2=((PAND1
    6)=0):S0=((PAND4)=0)            :rem 177
520 FR=-((PAND32)=0):DX=S2+S3:DY=S0+S1
                                    :rem 191
525 IFFRTHENGOSUB9600               :rem 65
530 CH=28                           :rem 202
535 IFDX=-1THENCH=29                :rem 197
540 IFDY<>0THENCH=27                :rem 207
550 Z=P%+22*DY+DX                   :rem 195
560 IFPEEK(Z)=32THEN610             :rem 98
570 IFPEEK(Z)=40ORPEEK(Z)=41THEN8000
                                    :rem 166
580 IFPEEK(Z)=31THEN500             :rem 97
590 IFPEEK(Z)=30THENIFPEEK(Z+C)<>13THEN50
    0                               :rem 59
600 IFPEEK(Z)>=0ANDPEEK(Z)<=26THENGOTO400
    0                               :rem 80
605 IFPEEK(Z)>=36ANDPEEK(Z)<=39THEN6000
                                    :rem 91
606 IFPEEK(Z)=42THEN9000            :rem 150
610 POKEP%,32                       :rem 204
620 POKEZ,CH:POKEZ+C,15:P%=Z        :rem 225
625 GS=GS-2:IFGS=<0THENSG=1:GOSUB9700
                                    :rem 58
630 RETURN                          :rem 121
1000 L1%=FNA(3)+1:L1%=L1%*2-1:IFL1%=3THEN
     L1%=2                          :rem 229
1010 L2%=FNA(4):POKET%(L2%),30:POKET%(L2%
     )+C,L1%+8                      :rem 214
1020 RETURN                         :rem 163
2000 RU=0:XF%=FNA(26):A$="{HOME}{20 DOWN}
     ":B$="{21 SPACES}"             :rem 70
2005 PRINTA$;B$:PRINTB$:PRINTA$;"{WHT}CAB
     BY, GO TO THE":PRINTF$(XF%);   :rem 94
2020 RETURN                         :rem 164
2500 ZT=PEEK(Z+C)                   :rem 240
2505 IFZT=20RZT=7THEN3500             :rem 2
2510 RETURN                         :rem 168
3000 REM MAP                        :rem 133
3005 A$="{BLK}←←←←←←←←←←←←←←←←←←←←":PRIN
     T"{HOME}{BLK}←←←←←←←←{WHT}CABBY{BLK}
     ←←←←←←←←"                      :rem 157
3010 FORI=1TO20                     :rem 103
3015 PRINTA$:NEXTI                  :rem 125
3020 PRINT"{HOME}{DOWN}{11 RIGHT}{WHT}G
     {3 RIGHT}B":PRINT"{RIGHT}{3 SPACES}
     {2 RIGHT}{14 SPACES}Z"         :rem 154
3030 PRINT"{RIGHT} {4 RIGHT}D{RIGHT}
     {7 RIGHT} {RIGHT}S "           :rem 196
3040 PRINT"{RIGHT} {2 RIGHT}M{4 SPACES}
     {RIGHT}S{3 SPACES}Y{RIGHT} {2 RIGHT}
      "                             :rem 92
3050 PRINT"{RIGHT} {6 RIGHT} {RIGHT}L
     {RIGHT} {2 RIGHT} {2 RIGHT} V"
                                    :rem 180
3060 PRINT"{RIGHT} {RIGHT}I{4 RIGHT}
     {2 RIGHT} {RIGHT} {2 RIGHT} T{RIGHT}
      "                             :rem 147
3070 PRINT"{WHT}A{13 SPACES}{RIGHT}Q
     {4 SPACES}"                    :rem 79
3080 PRINT"{RIGHT} {3 RIGHT} N{2 RIGHT}S
     {RIGHT} {RIGHT} {2 RIGHT} {RIGHT}O "
                                    :rem 203
3090 PRINT"W {3 RIGHT} {5 RIGHT} {RIGHT}
     {4 SPACES}P{RIGHT} "           :rem 102
3100 PRINT"{RIGHT}{3 SPACES}G{7 SPACES}
     {RIGHT} {2 RIGHT} {2 RIGHT} U"
                                    :rem 223
3110 PRINT"{RIGHT} {3 RIGHT} {RIGHT}M
     {5 RIGHT} H{RIGHT}{4 SPACES}"
                                    :rem 106
3120 PRINT"{RIGHT} D{RIGHT}J {2 RIGHT}T
     {2 RIGHT}{3 SPACES}{RIGHT}B
     {2 RIGHT} "                    :rem 192
3130 PRINT"B {2 RIGHT}K {2 RIGHT}
     {2 RIGHT}R{RIGHT} {2 RIGHT} E{RIGHT}
      R"                            :rem 48
3140 PRINT"{RIGHT} {3 RIGHT}{12 SPACES}
     {2 RIGHT} "                    :rem 71
3150 PRINT"{RIGHT}{5 SPACES}{3 RIGHT}
     {6 RIGHT} {RIGHT}O "           :rem 40
3160 PRINT"G {RIGHT}X{RIGHT} {2 RIGHT}S
     {RIGHT}T{8 SPACES}"            :rem 114
3170 PRINT"{RIGHT} {3 RIGHT} {3 RIGHT}
     {2 RIGHT} G{2 RIGHT} {2 RIGHT} "
                                    :rem 92
3180 PRINT"{RIGHT}{12 SPACES}{2 RIGHT}
     {2 SPACES}M{RIGHT} F"          :rem 164
3190 PRINT"{RIGHT}C{2 RIGHT}N{2 RIGHT}R
     {4 RIGHT}B"                    :rem 200
3200 POKEH+46,40:POKEH+47,41:POKEH+46+C,5
     :POKEH+47+C,5                  :rem 100
3250 X=15:Y=19:POKEFNL(0),42:POKEFNL(0)+C
     ,7                             :rem 246
3300 RETURN                         :rem 166
4000 IFCF%<>0THEN4500               :rem 163
4005 IFPEEK(Z)=0THENXF%=99:GOTO4200
                                    :rem 111
4010 IFPEEK(Z)<>XF%THEN500          :rem 37
4200 CF%=FNA(26):SP=Z:POKEZ,CH:POKEZ+C,15
     :POKEP%,32                     :rem 95
4260 PRINTA$;B$:PRINTB$:PRINTA$;"{WHT}TAK
     E ME TO THE":PRINTF$(CF%):FORT=1TO99
     :NEXT                          :rem 24
4280 POKEP%,CH:POKEP%+C,15:POKEZ,XF%:POKE
     Z+C,1:IFXF%=99THEN4290         :rem 128
4285 GOTO 4300                      :rem 211
4290 POKEZ,31:POKEZ+C,0             :rem 117
4300 GOTO630                        :rem 153
4500 IFPEEK(Z)<>CF%THEN630          :rem 24
4510 POKEZ,CH:POKEZ+C,15:POKEP%,32:rem 60
4550 M1=ABS(SP-Z)/10+1              :rem 198
4560 M2=INT(FNA(100*M1)/10)/100     :rem 118
4570 FORI=1TO3:PRINTA$;B$:PRINTB$:PRINTA$
     ;"YOU COLLECT";M1:PRINT"PLUS TIP OF"
     ;M2                            :rem 48
4575 FORT=1TO500:NEXTT,I            :rem 248
4580 M3=INT(M1+M2+M3):M1=0:M2=0     :rem 232
4600 PRINTA$;B$:PRINTB$:PRINTA$;"ON YOU";
     M3:FORT=1TO650:NEXTT           :rem 120
4650 POKEP%,CH:POKEP%+C,15:POKEZ,CF%:POKE
     Z+C,1:CF%=0:XF%=0              :rem 242
4700 GOTO630                        :rem 157
```

```
5000 I=FNA(4):Q1=1                    :rem 207
5005 Y=INT((P%-H)/22):X=(P%-H)-22*Y
                                      :rem 136
5010 Y1=INT((B%(I)-H)/22):X1=(B%(I)-H)-22
     *Y1                              :rem 47
5015 BX=0:BY=0                        :rem 20
5020 BX=(X1>X)-(X>X1)                 :rem 171
5050 BY=(Y1>Y)-(Y>Y1)                 :rem 179
5100 NC=B%(I)+BX+BY*22:IFNC>8097THENRETUR
     N                                :rem 45
5110 IFPEEK(NC)=31THEN5200            :rem 244
5115 IFPEEK(NC)<=26THEN5200           :rem 57
5117 IFPEEK(NC)=30THEN5200            :rem 250
5120 IFNC=P%THEN6000                  :rem 143
5150 POKEB%(I),32                     :rem 140
5155 TY=37:IFBX<0THENTY=36            :rem 117
5156 IFBY<0THENTY=38                  :rem 235
5157 IFBY>0THENTY=39                  :rem 239
5160 POKENC,TY:POKENC+C,4:B%(I)=NC:rem 54
5170 I=I+1:IFI=>4THENI=1              :rem 159
5175 Q1=Q1+1:IFQ1<=LVTHEN5005         :rem 206
5180 RETURN                           :rem 174
5200 BX=FNA(2)-1:BY=FNA(2)-1          :rem 28
5240 GOTO5100                         :rem 202
6000 PRINT"{CLR}":POKE36879,8:POKE36869,2
     40                               :rem 67
6050 PRINT"{4 DOWN}{2 SPACES}YOUR CAB HAS
      BEEN"                           :rem 235
6060 PRINT"{DOWN}CRUNCHED BY A TROLLEY"
                                      :rem 1
6070 PRINT"{3 DOWN}{6 RIGHT}GAME OVER!"
                                      :rem 246
6075 PRINT"{2 DOWN}YOU MADE{RVS}";M4;"DOL
     LARS"                            :rem 55
6077 PRINT"{2 DOWN}{3 SPACES}PLAY AGAIN (
     Y/N)"                            :rem 132
6080 GETZ$:IFZ$=""OR(Z$<>"Y"ANDZ$<>"N")TH
     EN6080                           :rem 213
6090 IFZ$="N"THENEND                  :rem 177
6095 M1=0:M2=0:M3=0:M4=0:GOTO150      :rem 61
7000 X=FNA(20):Y=FNA(19)              :rem 68
7010 IFPEEK(FNL(0))<>31THEN7040       :rem 6
7030 POKEFNL(0),0:POKEFNL(0)+C,3      :rem 77
7040 RETURN                           :rem 171
8000 IFRU=1THENRETURN                 :rem 123
8005 M4=M4+M3                         :rem 183
8010 POKE214,19:PRINT:POKE211,1:PRINT"
     {LEFT}{16 SPACES}"               :rem 238
8015 POKE214,20:PRINT:POKE211,1:PRINT"
     {WHT}{LEFT}SAFE IN DEPOT";M4;:rem 25
8020 M3=0:POKEP%,CH:POKEP%+C,15:POKEZ,40:
     POKEZ+C,5                        :rem 15
8025 IFM4>200THEN8300                 :rem 169
8030 FORJ=1TO5:FORI=15TO0STEP-1:POKE36878
     ,I:POKE36876,230                 :rem 226
8035 FORT=1TO10:NEXTT,I:POKE36876,0:NEXTJ
                                      :rem 85
8040 IFCF%=0THENPRINTA$;B$:PRINTB$:PRINTA
     $;"{WHT}CABBY, GO TO THE":PRINTF$(XF
     %):GOTO630                       :rem 13
8050 IFCF%<>0THENPRINTA$;B$:PRINTB$:PRINT
     A$;"{WHT}TAKE ME TO THE":PRINTF$(CF%
     ):GOTO630                        :rem 202
8300 POKE36869,240:PRINT"{CLR}":PRINT"
     {5 DOWN}{WHT}YOU HAVE SAVED ENOUGH"
                                      :rem 41
8301 PRINT"{DOWN}{3 SPACES}TO BUY YOUR CA
     B"                               :rem 86
8400 PRINT"{3 DOWN}{6 RIGHT}{WHT}YOU WIN!
     !":FORI=1TO6:POKE36879,107:FORT=1TO5
     0:NEXTT:GOTO6077                 :rem 158
8450 POKE36879,15:FORT=1TO50:NEXTT,I
                                      :rem 208
9000 POKEZ,CH:POKEZ+C,15:POKEP%,32:rem 59
9005 GS=1400                          :rem 106
9020 FORI=1TO10:POKE36878,15:FORT=230TO28
     0STEP10:POKE36876,100+T/3        :rem 174
9025 NEXTT:POKE36876,0:POKE36878,0:FORT=1
     TO55:NEXTT,I                     :rem 61
9100 POKE P%,CH:POKEP%+C,1:POKEZ,42:POKEZ
     +C,7                             :rem 183
9150 GOTO630                          :rem 161
9600 IFRU=1THENRETURN                 :rem 130
9603 PRINTA$;B$:PRINTB$               :rem 146
9605 PRINTA$;"{WHT}←E{5 SPACES}F←":PRINT"
     ←{7 SPACES}←";                   :rem 151
9610 A1=INT(GS/200)                   :rem 22
9620 PRINTA$;TAB(A1);"{RED}←":PRINTTAB(A1
     );"{RED}←"                       :rem 237
9630 FORT=1TO1000:NEXTT               :rem 172
9640 IFCF%<>0THENPRINTA$;B$:PRINTB$:PRINT
     A$;"{WHT}TAKE ME TO THE":PRINTF$(CF%
     ):GOTO9660                       :rem 12
9650 IFXF%<>0THENPRINTA$;B$:PRINTB$:PRINT
     A$;"{WHT}CABBY GO TO":PRINTF$(XF%)
                                      :rem 78
9660 RETURN                           :rem 181
9700 FORII=1TO9:PRINTA$;B$:PRINTB$
                                      :rem 141
9750 PRINTA$;"{CYN}{RVS}OUT OF GAS":GOSUB
     5000:NEXTII:GS=700               :rem 145
9760 PRINTA$;B$:PRINTB$:PRINTA$;"BACK WIT
     H 1/2 TANKFUL";:FORDL=1TO2500:NEXT
                                      :rem 114
9770 XF%=0:CF%=0:RETURN               :rem 118
10001 DATA 7384,40,105,125,60,60,125,105,
      40                              :rem 50
10002 DATA 7392,68,68,190,190,190,190,68,
      68                              :rem 98
10003 DATA7400,17,17,190,190,190,190,17,1
      7                               :rem 65
10004 DATA 7408,0,8,42,42,42,8,4,4
                                      :rem 124
10005 DATA 7416,255,255,255,255,255,255,2
      55,255                          :rem 34
10006 DATA 7168,60,60,25,127,124,124,24,6
      0                               :rem 14
10007 DATA 7456,64,32,15,255,131,253,253,
      108                             :rem 123
10008 DATA 7464,2,4,8,255,193,191,191,54
                                      :rem 190
10009 DATA 7472,30,24,23,23,64,87,151,30
                                      :rem 174
10010 DATA 7480,30,151,87,64,23,23,24,30
                                      :rem 165
10011 DATA 7488,0,255,170,255,136,136,136
      ,136                            :rem 176
10012 DATA 7496,0,255,171,255,143,143,141
      ,141                            :rem 165
10013 DATA 7504,15,25,41,47,47,47,31,15
                                      :rem 124
10015 DATAAIRPORT,BANK,"CURLING RINK","DO
      CTORS OFFICE","EMPLOYMENT OFFICE",F
      ACTORY                          :rem 214
10016 DATAGROCERY STORE,HOSPITAL,INN,JEWE
      LER,KENNEL,LIBRARY,MOTEL,"NIGHT CLU
      B",OFFICE                       :rem 84
10017 DATA "POST OFFICE",QUARRY,RESTAURAN
      T,SCHOOL,THEATER,UNIVERSITY,"VETS"
                                      :rem 187
10018 DATA"WEATHER OFFICE","XRAY OFFICE",
      YMCA,ZOO                        :rem 238
```

Program 2: Cabby (64 Version)

```
5 POKE53281,11:POKE53280,11:PRINTCHR$(142
  ):POKE52,56:POKE56,56:CLR        :rem 139
10 PRINT"{CLR}":DIM A%(26),F$(26),TL%(12)
   ,T1%(12),LC%(70),CM%(26)        :rem 168
15 POKE214,12:PRINT:POKE211,5:PRINT"{WHT}
   SETTING UP ........PLEASE WAIT":rem 18
20 FORI=1TO26:READF$(I):NEXTI       :rem 39
50 POKE56334,PEEK(56334)AND254:POKE1,PEEK
   (1)AND251                        :rem 134
51 FORI=0TO511:POKEI+14336,PEEK(I+53248):
   POKEI+15360,PEEK(I+54272):NEXT:rem 166
52 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)
   OR1                              :rem 86
55 FORI=1TO12:READZ:FORJ=ZTOZ+7:READK:POK
   EJ,K:NEXTJ,I                     :rem 34
100 FORI=1TO26:READA%(I):NEXT:FORI=1TO8:R
   EADV(I):NEXT                     :rem 123
110 FORI=1TO26:IFI=1THENCM%(I)=A%(I):GOTO
   150                              :rem 127
120 CM%(I)=CM%(I-1)+A%(I)           :rem 247
150 NEXT:H=1024:C=54272:S=C:CH=28:FORI=1T
   O5:READB%(I),E%(I):NEXT          :rem 66
160 FORI=1TO12:READT1%(I):NEXT      :rem 78
165 DEFFNA(X)=INT(RND(1)*X)+1:DEFFNL(Q)=H
   +40*Y+X                          :rem 75
167 DEFFND(ZZ)=ABS((ZZ=39)+(ZZ=-39)+(ZZ=4
   1)+(ZZ=-41))                     :rem 51
170 FORI=1TO5:A=FNA(2):D%(I)=(A=1)-(A=2):
   NEXT                             :rem 63
175 FORI=1TO5:TR(I)=(D%(I)=-1)*(-E%(I))-(
   D%(I)=1)*(B%(I))                 :rem 208
176 VR(I)=(TR(I)=E%(I))-(TR(I)=B%(I)):IFI
   >2THENVR(I)=VR(I)*40             :rem 235
177 TY=(VR(I)=1)*36+(VR(I)=-1)*37+(VR(I)=
   40)*39+(VR(I)=-40)*38:TY(I)=(-1)*TY
                                    :rem 100
180 ED(I)=(TR(I)=B%(I))*(-E%(I))+(TR(I)=E
   %(I))*(-B%(I)):NEXT              :rem 147
185 PRINT"{CLR}":POKE214,8:PRINT:POKE211,
   13:PRINT"{WHT}SELECT A LEVEL" :rem 67
187 POKE214,10:PRINT:POKE211,16:PRINT"1)
   {SPACE}EASY"                     :rem 225
189 POKE214,12:PRINT:POKE211,16:PRINT"2)
   {SPACE}HARD"                     :rem 211
190 GETZ$:LV=VAL(Z$):RD=RND(1):IFZ$=""THE
   N190                             :rem 199
191 IFLV<1ORLV>2THEN190             :rem 181
195 PRINT"{CLR}":POKE53272,(PEEK(53272)AN
   D240)OR14                        :rem 212
197 FORMC=STOS+24:POKEMC,0:NEXT:POKES+24,
   15:POKES+5,120:POKES+6,240:HF=S+1:LF=
   S                                :rem 166
200 PRINT"{CLR}":GOSUB3005:FORI=1TO12:A=T
   1%(I):GOSUB3200:NEXT             :rem 74
210 P%=H+81:POKEP%,CH:POKEP%+C,7    :rem 101
220 M1=0:M2=0:M3=0:M4=0:XF%=0:CF%=0:GS=14
   00                               :rem 137
300 GOSUB1000:IFEN=1THEN6000        :rem 147
310 IFXF%=0THENGOSUB2000            :rem 196
320 GOSUB400:IFEN=1THEN6000         :rem 104
330 GOSUB7000:GOSUB500:IFEN=1THEN6000
                                    :rem 235
340 GOSUB1000:IFEN=1THEN6000        :rem 151
350 GOSUB5000:IFEN=1THEN6000        :rem 156
360 GOSUB500:IFEN=1THEN6000         :rem 109
390 GOTO300                         :rem 104
400 FORT=1TO5:A=TR(T):TR(T)=TR(T)+VR(T)
                                    :rem 157
410 IFTR(T)=ED(T)THENVR(T)=(-1)*VR(T):GOS
   UB700:GOTO440                    :rem 21
420 IFPEEK(TR(T))>=36ANDPEEK(TR(T))<=39TH
   ENTR(T)=TR(T)-VR(T):GOTO450      :rem 203
430 IFPEEK(TR(T))=27ORPEEK(TR(T))=28THENE
   N=1:T=5:GOTO450                  :rem 210
440 POKEA,32:POKETR(T),TY(T):POKETR(T)+C,
   15:GOSUB9810:IFN4=1THEN450       :rem 140
445 GOSUB500:IFEN=1THENT=5          :rem 113
450 NEXT:RETURN                     :rem 242
500 JV=PEEK(56320):JV=15-(JVAND15):FR=PEE
   K(56320)AND16                    :rem 123
505 IFFR=0ANDSH=0THENGOSUB9600      :rem 135
510 DY=(JV=1)+(JV=5)+(JV=9)-(JV=6)-(JV=10
   )-(JV=2)                         :rem 201
520 DX=(JV=4)+(JV=5)+(JV=6)-(JV=9)-(JV=10
   )-(JV=8)                         :rem 210
525 IF(DX=0ANDDY=0)ORGS=0THENRETURN
                                    :rem 25
535 CH=28:IFDX<>0THENCH=28          :rem 63
540 IFDY<>0THENCH=27                :rem 207
550 ZZ=40*DY+DX:Z=P%+ZZ:PK=PEEK(Z)
                                    :rem 132
555 IFFND(ZZ)=1AND(PK=32ORPK=160)THEN625
                                    :rem 182
557 IFSH=1THEN800                    :rem 0
560 CP=(PK=30)+(PK=32)*2+(PK=40)*3+(PK=41
   )*4+(PK=42)*5+(PK=160)*6+(PK=0)*7
                                    :rem 129
570 ONABS(CP)GOTO600,620,8000,8000,9000,6
   25,3300                          :rem 30
580 IFPEEK(Z)>=129ANDPEEK(Z)<=154THEN4000
                                    :rem 188
590 IFPEEK(Z)>=36ANDPEEK(Z)<=39THENEN=1:R
   ETURN                            :rem 179
600 IF(PEEK(Z+C)AND15)=5THEN620     :rem 38
605 GOTO625                         :rem 113
620 GOSUB9820:POKEP%,32:POKEZ,CH:POKEZ+C,
   7:P%=Z                           :rem 174
625 GS=GS-2:IFGS=<0THENGS=0:GOSUB9700
                                    :rem 57
630 RETURN                          :rem 121
700 TY=(VR(T)=1)*36+(VR(T)=-1)*37+(VR(T)=
   40)*39+(VR(T)=-40)*38:TY(T)=(-1)*TY
                                    :rem 147
710 ED=(ED(T)=B%(T))*(-E%(T))+(ED(T)=E%(T
   ))*(-B%(T)):ED(T)=ED             :rem 181
720 RETURN                          :rem 121
800 IFPEEK(Z)=30AND(PEEK(Z+C)AND15)=5THEN
   620                              :rem 107
810 IFPEEK(Z)<>32THEN625            :rem 163
820 GOTO620                         :rem 107
1000 FORLL=1TO12:PK=PEEK(TL%(LL)+C)AND15
                                    :rem 145
1005 IFPEEK(TL%(LL))=32THENPOKETL%(LL),30
   :POKETL%(LL)+C,PK                :rem 2
1010 POKETL%(LL)+C,PK:TL=(PK=2)*1+(PK=5)*
   2+(PK=7)*3                       :rem 110
1012 GOSUB500:IFEN=1THENLL=12:GOTO1030
                                    :rem 65
1015 GOSUB400:IFEN=1THENLL=12:GOTO1030
                                    :rem 67
1020 GOSUB5000:IFEN=1THENLL=12:GOTO1030
                                    :rem 112
1025 ONABS(TL)GOSUB1040,1050,1060 :rem 86
1030 NEXT:RETURN                    :rem 29
1040 A=FNA(3):IFA=1THENPOKETL%(LL)+C,5:PO
   KETL%(LL),30                     :rem 149
1045 RETURN                         :rem 170
1050 A=FNA(3):IFA=2THENPOKETL%(LL)+C,7:PO
   KETL%(LL),30                     :rem 153
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1055 RETURN                              :rem 171
1060 A=FNA(3):IFA=3THENPOKETL%(LL)+C,2:PO
     KETL%(LL),30                        :rem 150
1065 RETURN                              :rem 172
1500 FORI=22TO23:FORJ=1TO37              :rem 133
1510 POKE214,I:PRINT:POKE211,J:PRINTCHR$(
     32);:NEXTJ,I:RETURN                 :rem 71
2000 PX=FNA(26):XF%=PX+128               :rem 221
2005 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                         :rem 190
2010 PRINT"{WHT}CABBY GO TO THE ";F$(XF%-
     128);:PT=PX:CL=0:X=1:GOSUB5155
                                         :rem 83
2020 GOSUB500:RETURN                     :rem 243
3005 I=49152:IF PEEK(49154)=216THENSYS491
     60:GOTO3030                         :rem 218
3010 READ A:IF A=256 THENSYS49160:GOTO303
     0                                   :rem 112
3020 POKE I,A:I=I+1:GOTO 3010            :rem 70
3030 POKE1064,40:POKE1065,41:POKE1066,40:
     POKE1067,41:FORI=1064TO1067:POKEI+C,
     1:                                  :rem 62
3040 NEXT:POKE1104+C,1:POKE1104,40:FORI=1
     105TO1107:POKEI,32:POKEI+40,32:NEXT
                                         :rem 39
3050 POKE1144,40:POKE1144+C,1:FORI=1265TO
     1301:POKEI,32:NEXT                  :rem 232
3055 FORI=1545TO1581:POKEI,32:NEXT:rem 55
3060 FORI=1114TO1754STEP40:POKEI,32:POKEI
     +10,32:POKEI+20,32:NEXT             :rem 108
3065 FORI=1TO5                           :rem 68
3067 X=FNA(38):Y=FNA(19):L=FNL(Q):rem 155
3070 IFPEEK(L)=32ORPEEK(L)<>160THEN3067
                                         :rem 48
3075 POKEL,42:POKEL+C,7:NEXT             :rem 219
3080 K=0:FORI=1TO26:FORJ=1TOA%(I):rem 226
3090 X=FNA(40):Y=FNA(19):L=FNL(Q):rem 144
3100 IF PEEK(L)=32ORPEEK(L)<>160THEN3090
                                         :rem 38
3110 IFPEEK(L+1)=160ANDPEEK(L-1)=160ANDPE
     EK(L+40)=160ANDPEEK(L-40)=160THEN309
     0                                   :rem 250
3120 K=K+1:LC%(K)=L:POKEL,I+128:NEXT:NEXT
     :RETURN                              :rem 4
3200 IFPEEK(A)<>32THENGOSUB3220          :rem 96
3210 TL%(I)=A:POKEA,30:POKEA+C,5:RETURN
                                         :rem 111
3220 FORJ=1TO8                           :rem 65
3230 IFPEEK(A+V(J))=32THENA=A+V(J):K=8
                                         :rem 208
3240 NEXT:RETURN                         :rem 34
3300 IFXF%<>0THENRETURN                  :rem 209
3310 POKEP%,32:POKEZ,CH:POKEZ+C,7:GOSUB20
     00                                  :rem 134
3320 POKEP%,CH:POKEP%+C,7:POKEZ,160:POKEZ
     +C,1:MN=1:RETURN                    :rem 67
3330 M1=ABS(SP-Z)/10+1:POKEP%,32:POKEZ,CH
     :POKEZ+C,7:GOSUB9820                :rem 203
3340 M2=INT(FNA(100*M1)/10)/100          :rem 113
3350 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                         :rem 194
3360 PRINT"YOU COLLECT";M1;"PLUS TIP OF";
     M2;                                 :rem 147
3370 M3=M1+M2+M3:M1=0:M2=0:POKEP%,CH:POKE
     P%+C,7:POKEZ,XF%:POKEZ+C,1          :rem 44
3375 PT=PX:CL=1:X=1:GOSUB5155            :rem 28
3380 POKE214,23:PRINT:POKE211,1:PRINT"YOU
      HAVE";M3;:MN=0:XF%=0:CF%=0:RETURN
                                         :rem 131
4000 IFMN=1THEN3330                      :rem 84
4005 IFCF%<>0THEN4500                    :rem 168
4010 IFPEEK(Z)<>XF%THEN6300              :rem 41
4030 IFLV=2ANDZ<>DZTHEN6300              :rem 116
4050 PC=FNA(26):CF%=PC+128               :rem 165
4200 SP=Z:POKEZ,CH:POKEZ+C,7:POKEP%,32:GO
     SUB9820                             :rem 10
4210 IFLV=1THENPT=PC:CL=1:GOSUB5155
                                         :rem 202
4260 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                         :rem 195
4265 PRINT"{WHT}TAKE ME TO THE ";F$(CF%-1
     28);:PT=PC:CL=0:X=2:GOSUB5155
                                         :rem 248
4280 POKEP%,CH:POKEP%+C,7:GOSUB9820:POKEZ
     ,XF%:POKEZ+C,1                      :rem 165
4285 IFCF%=XF%THENPOKEZ+C,0              :rem 146
4290 IFLV=1ANDXF%<>CF%THENPT=PX:CL=1:GOSU
     B5155                               :rem 165
4300 GOTO6300                            :rem 153
4500 IFPEEK(Z)<>CF%THEN6300              :rem 24
4505 IFLV=2ANDZ<>DCTHEN6300              :rem 100
4510 POKEZ,CH:POKEZ+C,7:POKEP%,32:GOSUB98
     20                                  :rem 154
4550 M1=ABS(SP-Z)/10+1                   :rem 198
4560 M2=INT(FNA(100*M1)/10)/100          :rem 118
4570 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                         :rem 199
4573 PRINT"YOU COLLECT";M1;"PLUS TIP OF";
     M2;                                 :rem 154
4580 M3=M1+M2+M3:M1=0:M2=0               :rem 172
4600 POKE214,23:PRINT:POKE211,1:PRINT"YOU
      HAVE";M3;                          :rem 100
4650 POKEP%,CH:POKEP%+C,7:GOSUB9820:POKEZ
     ,CF%:POKEZ+C,1                      :rem 145
4655 IFLV=1THENPT=PC:CL=1:GOSUB5155
                                         :rem 215
4660 CF%=0:XF%=0:GOTO6300                :rem 97
5000 MX=0:MY=0:GOTO5010                  :rem 93
5005 MY=INT((P%-H)/40):MX=(P%-H)-40*MY:RE
     TURN                                :rem 137
5010 GOSUB5005:CT=ABS((MY=6)*1+(MY=13)*2)
     :T=CT:IFCT>0THENGOSUB5050           :rem 210
5015 GOSUB5005:CT=ABS((MX=10)*3+(MX=20)*4
     +(MX=30)*5):T=CT:IFCT>0THENGOSUB5050
                                         :rem 34
5020 RETURN                              :rem 167
5050 IFP%>TR(CT)ANDVR(CT)>0THEN5080
                                         :rem 103
5060 IFP%<TR(CT)ANDVR(CT)<0THEN5080
                                         :rem 100
5070 VR(CT)=(-1)*VR(CT):GOSUB700         :rem 83
5080 B=FNA(2):DN=(B=1)*(-P%)-(B=2)*(ED(CT
     ))                                  :rem 230
5100 POKETR(CT),32:FORMV=TR(CT)TODNSTEPVR
     (CT):PK=PEEK(MV)                    :rem 207
5110 IFPK>=36ANDPK<=39THENTR(CT)=MV-VR(CT
     ):MV=DN:NEXT:GOSUB5150:RETURN:rem 70
5115 IFPK=27ORPK=28THENMV=DN:NEXT:EN=1:RE
     TURN                                :rem 238
5120 POKEMV,TY(CT):POKEMV+C,15:SH=1
                                         :rem 170
5125 GOSUB9810:GOSUB500:SH=0:POKEMV,32
                                         :rem 77
5126 IFEN=1THENMV=DN                     :rem 255
5130 NEXT:IFEN=1THENRETURN               :rem 225
5135 IFDN=ED(CT)THENTR(CT)=ED(CT)-VR(CT):
     POKEED(CT),TY(CT):RETURN            :rem 122
5140 TR(CT)=DN:POKETR(CT),TY(CT):RETURN
                                         :rem 249
5150 POKETR(CT),TY(CT):GOSUB500:RETURN
                                         :rem 178
5155 IFLV=2THENONXGOTO5160,5170           :rem 146
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5156 FORLC=CM%(PT-1)+1TOCM%(PT)    :rem 53
5157 POKELC%(LC)+C,CL:NEXT:RETURN :rem 81
5160 R=FNA(A%(PT)):DZ=LC%(CM%(PT-1)+R):PO
     KEDZ+C,0:RETURN               :rem 102
5170 R=FNA(A%(PT)):DC=LC%(CM%(PT-1)+R):PO
     KEDC+C,0:RETURN               :rem 57
6000 PRINT"{CLR}":EN=0:GOSUB9830:POKE5327
     2,21                          :rem 237
6050 POKE214,8:PRINT:POKE211,6:PRINT"
     {WHT}YOUR CAB LOST TO THE TROLLEY"
                                   :rem 49
6070 POKE214,10:PRINT:POKE211,15:PRINT"GA
     ME OVER!"                     :rem 248
6075 POKE214,12:PRINT:POKE211,8:PRINT"YOU
      MADE {RVS}";M4;"{OFF}DOLLARS"
                                   :rem 94
6080 PRINT"{2 DOWN}{12 RIGHT}PLAY AGAIN (
     Y/N)"                         :rem 218
6085 GETZ$:RD=RND(1):IFZ$=""OR(Z$<>"Y"AND
     Z$<>"N")THEN6085              :rem 82
6090 IFZ$="N"THENEND               :rem 177
6095 PRINT"{CLR}":RESTORE:GOTO165:rem 165
7000 X=FNA(40):Y=FNA(19)           :rem 70
7010 IFPEEK(FNL(Q))<>160THEN7040   :rem 90
7030 POKEFNL(Q),0:POKEFNL(Q)+C,3   :rem 143
7040 RETURN                        :rem 171
8000 M4=M4+M3:GOSUB9820            :rem 63
8010 GOSUB1500:POKE214,22:PRINT:POKE211,1
     :PRINT"{WHT}SAFE IN DEPOT";M4
                                   :rem 190
8020 M3=0:POKEP%,CH:POKEP%+C,7:POKEZ,40:P
     OKEZ+C,1:FORDL=1TO500:NEXT    :rem 172
8025 IFM4>200THEN8300              :rem 169
8040 IFCF%<>0THEN8050              :rem 175
8041 IFXF%=0THEN630                :rem 84
8043 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                   :rem 198
8045 PRINT"{WHT}CABBY GO TO THE ";F$(XF%-
     128);:N4=1:GOSUB400:N4=0      :rem 127
8046 RETURN                        :rem 178
8050 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                   :rem 196
8060 PRINT"{WHT}TAKE ME TO THE ";F$(CF%-1
     28);:N4=1:GOSUB400:N4=0       :rem 39
8070 RETURN                        :rem 175
8300 PRINT"{CLR}":POKE214,8:PRINT:POKE211
     ,9:PRINT"{WHT}YOU HAVE SAVED ENOUGH"
                                   :rem 38
8310 POKE214,10:PRINT:POKE211,11:PRINT"TH
     E CAB IS YOURS"               :rem 97
8400 PRINT"{2 DOWN}{16 RIGHT}YOU WIN":GOS
     UB9840                        :rem 9
8450 POKE53272,21:GOTO6080         :rem 211
9000 POKEZ,CH:POKEZ+C,15:POKEP%,32:GS=140
     0                             :rem 17
9100 POKE P%,CH:POKEP%+C,1:POKEZ,42:POKEZ
     +C,7                          :rem 183
9150 RETURN                        :rem 175
9600 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                   :rem 198
9605 PRINT"{WHT}{RVS} {OFF}E{5 SPACES}F
     {RVS} {OFF}"                  :rem 125
9610 A1=INT(GS/200):POKE214,23:PRINT:POKE
     211,A1+1:PRINT"{CYN}"CHR$(95);
                                   :rem 10
9630 FORDL=1TO500:NEXT:IFCF%=0THEN9645
                                   :rem 83
9635 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                   :rem 206
9640 PRINT"{WHT}TAKE ME TO THE ";F$(CF%-1
     28);:N4=1:GOSUB400:N4=0:RETURN
                                   :rem 70
9645 IFXF%=0THENRETURN             :rem 166
9650 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                   :rem 203
9655 PRINT"{WHT}CABBY GO TO THE ";F$(XF%-
     128);:N4=1:GOSUB400:N4=0:RETURN
                                   :rem 161
9700 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                   :rem 199
9750 PRINT"{WHT}OUT OF GAS":N4=1:GOSUB400
     :N4=0:IFEN=1THENRETURN        :rem 141
9755 GOSUB1500:POKE214,22:PRINT:POKE211,1
                                   :rem 209
9760 PRINT"BACK WITH 1/2 TANKFUL{WHT}";:N
     4=1:GOSUB400:N4=0:IFEN=1THENRETURN
                                   :rem 85
9765 GOSUB5000:IFEN=1THENRETURN    :rem 249
9770 GS=700:GOSUB1500:POKE214,22:PRINT:PO
     KE211,1                       :rem 118
9780 IFXF%<>0THENPRINT"{WHT}CABBY GO TO T
     HE ";F$(XF%-128);:RETURN      :rem 42
9790 IFCF%<>0THENPRINT"{WHT}TAKE ME TO TH
     E ";F$(CF%-128);:RETURN       :rem 193
9800 RETURN                        :rem 177
9810 POKES+4,17:POKEHF,40:POKELF,250:POKE
     S+4,16:RETURN                 :rem 84
9820 POKES+4,33:POKEHF,50:POKELF,100:POKE
     S+4,32:RETURN                 :rem 76
9830 POKES+4,33:FORI=200TO70STEP-5:POKEHF
     ,I:POKELF,INT(I/2):NEXT:POKES+4,32
                                   :rem 198
9835 POKES+24,0:RETURN             :rem 98
9840 POKES+4,17:POKEHF,40:POKELF,200:FORI
     =1TO10:FORJ=70TO200STEP5:POKEHF,J
                                   :rem 136
9850 POKELF,90:NEXT:G=G+1:IFG<5THEN9840
                                   :rem 139
9860 POKES+4,16:POKES+24,0:RETURN :rem 14
9900 DATAAIRPORT,BANK,"CURLING RINK","DOC
     TORS OFFICE","EMPLOYMENT OFFICE"
                                   :rem 109
9910 DATAFACTORY,"GROCERY STORE",HOSPITAL
     ,INN                          :rem 190
9915 DATA"JEWELRY STORE",KENNEL,LIBRARY,M
     OTEL                          :rem 188
9920 DATA"NIGHT CLUB",OFFICE,"POST OFFICE
     ",QUARRY,RESTAURANT,SCHOOL,THEATER
                                   :rem 126
9930 DATA UNIVERSITY,"VETS","WEATHER OFFI
     CE","XRAY OFFICE",YMCA,ZOO    :rem 201
10001 DATA 14552,24,255,255,24,24,255,255
      ,24                          :rem 117
10002 DATA 14560,0,102,126,255,255,126,10
      2,0                          :rem 93
10004 DATA 14576,0,8,42,42,42,8,4,4
                                   :rem 176
10005 DATA 14584,8,28,62,28,28,28,28,28
                                   :rem 146
10006 DATA 14336,60,60,25,127,124,124,24,
      60                           :rem 57
10007 DATA 14624,64,32,15,255,131,253,253
      ,108                         :rem 166
10008 DATA 14632,2,4,8,255,193,191,191,54
                                   :rem 233
10009 DATA 14640,30,24,23,23,64,87,151,30
                                   :rem 217
10010 DATA 14648,30,151,87,64,23,23,24,30
                                   :rem 217
10011 DATA 14656,0,255,170,255,136,136,13
      6,136                        :rem 219
10012 DATA 14664,0,255,171,255,143,143,14
      1,141                        :rem 208
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10013 DATA 14672,15,25,41,47,47,47,31,15
                                    :rem 176
10014 DATA 1,5,2,3,1,2,5,1,2,4,1,1,6,7,5,
      2,1,6,3,5,1,2,1,1,1,1         :rem 130
10015 DATA1,-1,40,-40,-39,39,-41,41
                                    :rem 197
10016 DATA1265,1301,1545,1581,1114,1754,1
      124,1764,1134,1774            :rem 157
10260 DATA1151,1159,1169,1179,1429,1439,1
      449,1459,1669,1679,1689,1699
                                    :rem 214
10270 DATA 1,0,216,255,255,255,40 :rem 78
10280 DATA 0,169,81,133,251,169,40
                                    :rem 137
10290 DATA 133,253,169,4,133,252,133
                                    :rem 234
10300 DATA 254,169,147,32,210,255,162
                                     :rem 26
10310 DATA 0,160,0,169,160,145,253
                                    :rem 121
10320 DATA 200,192,39,208,249,24,165
                                    :rem 237
10330 DATA 253,105,40,133,253,144,2
                                    :rem 169
10340 DATA 230,254,232,224,19,208,229
                                     :rem 26
10350 DATA 160,0,169,4,145,251,169
                                    :rem 136
10360 DATA 255,141,15,212,169,128,141
                                     :rem 26
10370 DATA 18,212,173,27,212,41,3 :rem 76
10380 DATA 133,173,170,10,168,24,185
                                    :rem 236
10390 DATA 0,192,101,251,133,170,185
                                    :rem 226
10400 DATA 1,192,101,252,133,171,24
                                    :rem 165
10410 DATA 185,0,192,101,170,133,253
                                    :rem 221
10420 DATA 185,1,192,101,171,133,254
                                    :rem 225
10430 DATA 160,0,177,253,201,160,208
                                    :rem 222
10440 DATA 18,138,145,253,169,32,145
                                    :rem 243
10450 DATA 170,165,253,133,251,165,254
                                     :rem 80
10460 DATA 133,252,76,62,192,232,138
                                    :rem 241
10470 DATA 41,3,197,173,208,189,177
                                    :rem 205
10480 DATA 251,170,169,32,145,251,224
                                     :rem 30
10490 DATA 4,240,26,138,10,168,162
                                    :rem 135
10500 DATA 2,56,165,251,249,0,192 :rem 84
10510 DATA 133,251,165,252,249,1,192
                                    :rem 233
10520 DATA 133,252,202,208,238,76,62
                                    :rem 234
10530 DATA 192,169,1,160,0,153,0  :rem 24
10540 DATA 216,153,0,217,153,0,218
                                    :rem 124
10550 DATA 153,0,219,200,208,241,96,256
                                    :rem 125
```

First Aid

(Article on page 95.)

```
10 REM ***FIRST AID***              :rem 151
20 PRINT"{CLR}":POKE53280,0:POKE53281,0:P
   OKE646,3                         :rem 189
25 PRINT"{5 DOWN}{10 SPACES}PLEASE STAND
   {SPACE}BY"                       :rem 92
30 DIMM$(50),A$(50,100)             :rem 104
40 A=1                               :rem 19
50 READM$(A):IFM$(A)=""THEN70       :rem 103
60 A=A+1:GOTO50                      :rem 89
70 A=1:B=1                           :rem 0
80 READA$(A,B)                      :rem 233
90 IFA$(A,B)="9"THENGOTO120          :rem 18
100 IFA$(A,B)=""THENA=A+1:B=1:GOTO80
                                    :rem 21
110 B=B+1:GOTO80                    :rem 138
120 PRINT"{CLR}":PRINT"{UP}{10 RIGHT}
    {RVS}FIRST AID SELECTION{DOWN}"
                                    :rem 212
130 Q=1:S=0:RR=1                    :rem 153
140 FORA=1TO34:G=A                   :rem 52
150 IFA>20THENIFQTHENQ=0:PRINT"{HOME}
    {DOWN}":S=24                     :rem 97
160 IFA>26THENG=-16+A-26             :rem 85
170 PRINT"{YEL}"TAB(S)CHR$(G+64)"{CYN}"SP
    C(1)M$(A)                       :rem 254
180 NEXT                            :rem 216
190 POKE198,0                       :rem 199
200 PRINT"{HOME}{23 DOWN}{RVS}{YEL}ENTER
    {SPACE}LETTER OR NUMBER:{CYN}":rem 62
210 GETA$:IFA$=""THEN210             :rem 73
220 A=ASC(A$)-64                     :rem 54
225 IFASC(A$)<49ORASC(A$)>90THEN210
                                    :rem 245
230 IFA<1THENA=91+(A+15)-64         :rem 206
240 IFA>34ORA<0THEN210               :rem 27
250 PRINT"{CLR}"                    :rem 251
260 FORB=1TO100                      :rem 99
270 IFB>10ANDA=14ANDRR=1THENPRINT"
    {2 DOWN} {YEL}PRESS ANY KEY TO CONTIN
    UE{CYN}":GOSUB370               :rem 189
280 PRINT"{DOWN}"A$(A,B)            :rem 225
290 IFA$(A,B)=""THEN310             :rem 211
300 NEXT                            :rem 210
310 PRINT"{RVS}HIT ANY KEY TO RETURN TO M
    AIN MENU"                       :rem 173
320 POKE198,0                       :rem 194
330 GETA$:IFA$=""THEN330             :rem 79
340 GOTO120                          :rem 99
350 GETA$:IFA$=""THEN350             :rem 83
360 C=VAL(A$)                       :rem 178
370 POKE198,0                       :rem 199
380 GETA$:IFA$=""THEN380             :rem 89
390 PRINT"{CLR}":RR=0:RETURN        :rem 101
400 DATA"{RVS}{YEL}EMERGENCY NUMBERS{CYN}
    "                               :rem 252
410 DATA"APPENDICITIS"              :rem 112
420 DATA"ARTIF. RESPIRATION"        :rem 232
430 DATA"BITES (ANIMAL)","BITES (INSECT)"
     "BITES (SNAKE)"                 :rem 23
440 DATA "BLEEDING (SEVERE)"         :rem 75
450 DATA"BONE & JOINT INJURIES","BRUISES"
                                    :rem 187
460 DATA"BURNS (MINOR)"              :rem 88
470 DATA"BURNS (SERIOUS)","BURNS (V. SERI
    OUS)"                           :rem 247
480 DATA"BURNS (CHEMICAL)","CHOKING","DRU
    GS"                             :rem 115
490 DATA"EARACHE","ELECTRIC SHOCK","EPILE
    PSY"                            :rem 242
500 DATA"EXPOSURE TO COLD","EXPOSURE TO H
    EAT"                            :rem 227
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510 DATA"FAINTING","FEVER","HEART ATTACK"
    ,"HERNIAS","NOSE BLEED"          :rem 67
520 DATA"POISON (GAS)","POISON (ORAL)","S
    HOCK","SPRAINS","STRAINS"        :rem 204
530 DATA "STROKE","SUNBURN","SUNSTROKE","
    TOOTHACHE",""                    :rem 40
540 DATA"{RVS}{YEL}{8 RIGHT}***EMERGENCY
    {SPACE}NUMBERS***{CYN}"          :rem 229
550 DATA"{DOWN}POISON CONTROL CENTER:
    {2 SPACES}798-6200":DATA"DOCTOR:
    {2 SPACES}823-4796"              :rem 219
560 DATA"AMBULANCE:{2 SPACES}429-5111"
                                     :rem 79
570 DATA"DOCTOR:{2 SPACES}823-4796"
                                     :rem 163
580 DATA"HOSPITAL:{2 SPACES}823-1000"
                                     :rem 36
590 DATA"POLICE:{2 SPACES}429-8231"
                                     :rem 140
600 DATA"FIRE:{2 SPACES}823-2233",""
                                     :rem 88
610 DATA"{RVS}{12 RIGHT}APPENDICITIS","
    {DOWN}{RVS}1){OFF} CALL YOUR DOCTOR."
                                     :rem 195
620 DATA"{RVS}2){OFF} NEVER GIVE ANYTHING
     BY MOUTH."                      :rem 88
630 DATA"{RVS}3){OFF} ICE BAG MAY REDUCE
    {SPACE}DISCOMFORT.",""           :rem 201
640 DATA"{RVS}{6 RIGHT}ARTIFICIAL RESPIRA
    TION"                            :rem 224
650 DATA"{DOWN}{RVS}1){OFF} TILT HEAD BAC
    K."                              :rem 150
660 DATA"{RVS}2){OFF} PINCH NOSE SHUT. BL
    OW AIR INTO{10 SPACES}VICTIM'S MOUTH.
    "                                :rem 93
670 DATA"{RVS}3){OFF} REMOVE MOUTH;LOOK F
    OR EXHALATION."                  :rem 200
680 DATA"{RVS}4){OFF} REPEAT BLOWING CYCL
    E."                              :rem 110
690 DATA"{DOWN}{RVS}ADULT{OFF} - BREATHE
    {SPACE}DEEPLY EVERY 5 SECONDS."
                                     :rem 20
700 DATA"{RVS}CHILD{OFF} - BREATHE GENTLY
     EVERY 3 SECONDS.",""            :rem 99
710 DATA"{RVS}{13 RIGHT}ANIMAL BITES","
    {DOWN}{RVS}1){OFF} STOP BLEEDING."
                                     :rem 215
720 DATA"{DOWN}{RVS}2){OFF} WASH WOUND WI
    TH SOAP & WATER."                :rem 13
730 DATA"{DOWN}{RVS}3){OFF} RESTRICT MOVE
    MENT OF AFFECTED PART."          :rem 16
740 DATA"{DOWN}{RVS}4){OFF} ISOLATE ANIMA
    L FOR RABIES TEST.",""           :rem 73
750 DATA"{RVS}{13 RIGHT}INSECT BITES","
    {RVS}MINOR:","{RVS}1){OFF}"      :rem 113
760 DATA"{2 UP}{3 RIGHT}APPLY COLD SOOTHI
    NG LOTIONS(CALAMINE)"            :rem 58
770 DATA"{RVS}SEVERE REACTIONS:","{RVS}1)
    {OFF} GIVE ARTIFICIAL RESPIRATION"
                                     :rem 123
780 DATA"{UP}{3 RIGHT}IF NECESSARY."
                                     :rem 79
790 DATA"{RVS}2){OFF} APPLY CONSTRICTING
    {SPACE}BAND"                     :rem 47
800 DATA"{UP}{3 RIGHT}2-4 INCHES ABOVE ST
    ING."                            :rem 75
810 DATA"{RVS}3){OFF} KEEP AFFECTED PART
    {SPACE}DOWN"                     :rem 189
820 DATA"{UP}{3 RIGHT}AND APPLY ICE PACK.
    "                                :rem 87
830 DATA"{RVS}4){OFF} IF ALLERGIC REACTIO
    N -"                             :rem 78
840 DATA"{UP}{3 RIGHT}GET MEDICAL ATTENTI
    ON.",""                          :rem 5
850 DATA"{RVS}{13 RIGHT}SNAKE BITES"
                                     :rem 111
860 DATA"{DOWN}{RVS}1){OFF} GET VICTIM TO
     HOSPITAL."                      :rem 236
870 DATA"{RVS}2){OFF} RESTRICT MOVEMENT O
    F VICTIM."                       :rem 102
880 DATA"{RVS}3){OFF} IMMOBOLIZE AFFECTED
     PART BELOW"                     :rem 215
890 DATA"{UP}{3 RIGHT}LEVEL OF HEART."
                                     :rem 150
900 DATA"{RVS}4){OFF} APPLY CONSTRICTING
    {SPACE}BAND 2-4 INCHES"          :rem 119
910 DATA"{UP}{3 RIGHT}ABOVE BITE & BETWEE
    N BITE & HEART."                 :rem 141
920 DATA"{RVS}5){OFF} MAKE INCISION LENGT
    H-WISE(NOT DEEP)"                :rem 252
930 DATA"{UP}{3 RIGHT}AT FANG MARKS."
                                     :rem 63
940 DATA"{RVS}6){OFF} SUCK VENOM FROM WOU
    ND & SPIT OUT."                  :rem 6
950 DATA"{UP}{3 RIGHT}REPEAT FOR AT LEAST
     40 MINUTES."                    :rem 81
960 DATA"{RVS}7){OFF} TREAT FOR SHOCK.","
    "                                :rem 126
970 DATA"{10 RIGHT}{RVS}SEVERE BLEEDING",
    "{RVS}1){OFF} CALL FOR MEDICAL ASSIST
    ANCE."                           :rem 178
980 DATA"{RVS}2){OFF} LAY VICTIM DOWN & E
    LEVATE LEGS IN A{5 SPACES}SEMI-FLEXED
     POSITION."                      :rem 205
990 DATA"{RVS}3){OFF} CONTROL BLEEDING BY
     APPLYING DIRECT{5 SPACES}PRESSURE TO
     WOUND."                         :rem 236
1000 DATA"{RVS}4){OFF} IF BLEEDING CONTIN
    UES APPLY DIGITAL"               :rem 37
1010 DATA"{UP}{3 RIGHT}PRESSURE AT PRESSU
    RE POINT."                       :rem 71
1020 DATA"{RVS}5){OFF} ELEVATE BLEEDING P
    ART OF BODY{11 SPACES}ABOVE LEVEL OF
     HEART."                         :rem 121
1030 DATA"{RVS}6){OFF} MAINTAIN OPEN AIRW
    AY & GIVE VICTIM{6 SPACES}PLENTY OF
    {SPACE}FRESH AIR."               :rem 133
1040 DATA"{RVS}7){OFF} PREVENT LOSS OF HE
    AT WITH BLANKETS{6 SPACES}OVER & UND
    ER VICTIM.",""                   :rem 29
1050 DATA"{9 RIGHT}{RVS}BONE & JOINT INJU
    RIES"                            :rem 114
1060 DATA"{DOWN}{RVS}1){OFF} KEEP BONE EN
    DS & ADJACENT JOINTS{8 SPACES}STILL.
    "                                :rem 148
1070 DATA"{RVS}2){OFF} DO NOT MOVE VICTIM
     UNLESS ABSOLUTELY{4 SPACES}NECESSAR
    Y."                              :rem 101
1080 DATA"{RVS}3){OFF} APPLY WELL PADDED
    {SPACE}SPLINT TO INJURED{5 SPACES}PA
    RT."                             :rem 118
1090 DATA"{RVS}4){OFF} IF BROKEN BONE IS
    {SPACE}PROTRUDING  CONTROL{3 SPACES}
    BLEEDING."                       :rem 252
1100 DATA"{2 UP}{13 RIGHT}COVER WITH CLEA
    N DRESSING{5 SPACES}BEFORE SPLINTING
    ."                               :rem 209
1110 DATA"{RVS}5){OFF} TREAT FOR SHOCK.",
    ""                               :rem 160
1120 DATA"{15 RIGHT}{RVS}BRUISES"  :rem 4
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1130 DATA"{DOWN}{RVS}1){OFF} APPLY COLD C
     LOTH OR ICE PACK TO{9 SPACES}RELIEVE
      PAIN AND"                    :rem 143
1140 DATA"{2 UP}{19 RIGHT} REDUCE SWELLIN
     G.",""                       :rem 40
1150 DATA"{7 RIGHT}{RVS}MINOR BURNS(1ST D
     EGREE)"                      :rem 230
1160 DATA"{DOWN}{RVS}1){OFF} SUBMERGE RED
     DENED SKIN IN COLD WATER."   :rem 105
1170 DATA"{RVS}2){OFF} APPLY DRY DRESSING
      IF NECESSARY.",""           :rem 212
1180 DATA"{6 RIGHT}{RVS}SERIOUS BURNS(2ND
      DEGREE)"                    :rem 93
1190 DATA"{DOWN}{RVS}1){OFF} SUBMERGE BLI
     STERED SKIN IN COLD{9 SPACES}(NOT IC
     E) WATER."                   :rem 226
1200 DATA"{RVS}2){OFF} APPLY CLEAN CLOTHS
      SOAKED IN ICE{8 SPACES}WATER."
                                  :rem 166
1210 DATA"{RVS}3){OFF} APPLY PROTECTIVE B
     ANDAGE."                     :rem 189
1220 DATA"{RVS}4){OFF} ELEVATE AFFECTED P
     ARTS.",""                    :rem 132
1230 DATA"{5 RIGHT}{RVS}VERY SERIOUS BURN
     S(3RD DEGREE)"               :rem 135
1240 DATA"{DOWN}{RVS}1){OFF} DO NOT REMOV
     E ADHERED PARTICLES OF{6 SPACES}CLOT
     HING FROM CHARRED"           :rem 52
1250 DATA"{2 UP}{25 RIGHT}SKIN." :rem 128
1260 DATA"{RVS}2){OFF} ELEVATE AFFECTED P
     ARTS ABOVE VICTIM'S{3 SPACES}HEART."
                                  :rem 61
1270 DATA"{RVS}3){OFF} COVER BURNS WITH C
     LEAN THICK{12 SPACES}DRESSINGS-NO OI
     NTMENTS."                    :rem 174
1280 DATA"{RVS}4){OFF} TREAT FOR SHOCK, T
     HEN GET VICTIM TO{5 SPACES}HOSPITAL.
     ","                          :rem 181
1290 DATA"{3 RIGHT}{9 SPACES}{RVS}CHEMICA
     L BURNS"                     :rem 83
1300 DATA"{DOWN}{RVS}1){OFF} WASH FOR 5 O
     R MORE MINUTES WITH LARGE{3 SPACES}A
     MOUNTS OF WATER."            :rem 141
1310 DATA"{RVS}2){OFF} APPLY CLEAN DRESSI
     NG; GET TO HOSPITAL",""      :rem 252
1320 DATA"{8 RIGHT}{7 SPACES}{RVS}CHOKING
     ","{RVS}1){OFF} IF VICTIM CAN COUGH,
      BREATHE,OR TALK,"           :rem 126
1330 DATA"{2 UP}{3 RIGHT}DO NOTHING."
                                  :rem 118
1340 DATA"{RVS}2){OFF} IF VICTIM IS CLUTC
     HING THROAT,{10 SPACES}ENCOURAGE VIG
     OROUS"                       :rem 210
1350 DATA"{2 UP}{22 RIGHT}COUGHING."
                                  :rem 73
1360 DATA"{RVS}3){OFF} IF VICTIM STILL CA
     NNOT COUGH, BREATHE{3 SPACES}OR TALK
     , GIVE 4 SHARP"              :rem 65
1370 DATA"{UP}{3 SPACES}BLOWS BETWEEN SHO
     ULDER BLADES,"               :rem 136
1380 DATA"{UP}{3 SPACES}FOLLOWED BY 4 ABD
     OMINAL THRUSTS."             :rem 216
1390 DATA"{UP}{3 SPACES}REPEAT UNTIL OBJE
     CT IS DISLODGED."            :rem 25
1400 DATA"{RVS}4){OFF} IF VICTIM IS A CHI
     LD,HOLD UPSIDE DOWN{3 SPACES}& SLAP
     {SPACE}SHARPLY ON BACK."     :rem 106
1410 DATA"{RVS}5){OFF} IF BREATHING HAS S
     TOPPED & FOREIGN{6 SPACES}MATERIAL C
     ANNOT BE"                    :rem 13
1420 DATA"{2 UP}{22 RIGHT}DISLODGED"
                                  :rem 84
1430 DATA"{UP}{3 SPACES}ADMINISTER ARTIFI
     CIAL RESPIRATION."           :rem 253
1440 DATA"{UP}{3 SPACES}GET PROMPT MEDICA
     L ATTENTION.",""             :rem 189
1450 DATA"{6 SPACES}{11 RIGHT}{RVS}DRUGS"
                                  :rem 254
1460 DATA"{DOWN}{RVS}1){OFF} KEEP AIRWAY
     {SPACE}OPEN; GIVE ARTIFICIAL"
                                  :rem 154
1470 DATA"{UP}{3 RIGHT}VENTILATION OR CPR
      IF NEEDED."                 :rem 71
1480 DATA"{RVS}2){OFF} TREAT FOR SHOCK."
                                  :rem 55
1490 DATA"{RVS}3){OFF} PLACE UNCONSCIOUS
     {SPACE}VICTIM IN A 3"        :rem 193
1491 DATA"{UP}{3 SPACES}QUARTERS PRONE PO
     SITION."                     :rem 92
1500 DATA"{RVS}4){OFF} PROTECT VICTIM FRO
     M INJURY."                   :rem 85
1510 DATA"{RVS}5){OFF} HALLUCINOGENIC VIC
     TIMS MAY NEED{9 SPACES}CAREFUL ATTEN
     TION."                       :rem 52
1520 DATA"{RVS}6){OFF} GET VICTIM TO HOSP
     ITAL.",""                    :rem 122
1530 DATA"{16 RIGHT}{RVS}EARACHE":rem 242
1540 DATA"{DOWN}{RVS}1){OFF} CALL YOUR DO
     CTOR."                       :rem 155
1550 DATA"{RVS}2){OFF} APPLY ICE BAG OR H
     OT WATER BOTTLE;{6 SPACES}WHICHEVER
     {SPACE}GIVES RELIEF."        :rem 101
1560 DATA"","{9 SPACES}{RVS}{2 RIGHT}ELEC
     TRIC SHOCK"                  :rem 169
1570 DATA"{DOWN}{RVS}1){OFF} TURN OFF ELE
     CTRICITY IF POSSIBLE."       :rem 189
1580 DATA"{RVS}2){OFF} REMOVE ELECTRIC CO
     NTACT FROM VICTIM{5 SPACES}WITH DRY
     {SPACE}WOOD OR DRY"          :rem 68
1590 DATA"{2 UP}{24 RIGHT}CLOTH.","{RVS}3
     ){OFF} GIVE ARTIFICIAL RESPIRATION."
                                  :rem 160
1600 DATA"{RVS}4){OFF} KEEP VICTIM WARM."
      "{RVS}5){OFF} CALL YOUR DOCTOR.",""
                                  :rem 194
1610 DATA"{14 RIGHT}{RVS}EPILEPSY":rem 57
1620 DATA"{DOWN}{RVS}1){OFF} PREVENT VICT
     IM FROM INJURING HIMSELF{4 SPACES}BU
     T DO NOT RESTRAIN."          :rem 205
1630 DATA"{RVS}2){OFF} INSERT CLOTH BETWE
     EN TEETH TO PROTECT{3 SPACES}TONGUE.
     "                            :rem 190
1640 DATA"{RVS}3){OFF} LOOSEN TIGHT COLLA
     R; KEEP VICTIM WARM",""      :rem 9
1650 DATA"{11 RIGHT}{RVS}EXPOSURE (TO COL
     D)"                          :rem 12
1660 DATA"{DOWN}{RVS}1){OFF} COVER FROZEN
      PART.","{RVS}2){OFF} PROVIDE EXTRA
     {SPACE}CLOTHING BLANKETS."   :rem 216
1670 DATA"{RVS}3){OFF} BRING INDOORS."
                                  :rem 234
1680 DATA"{RVS}4){OFF} IMMERSE FROZEN PAR
     T IN WARM WATER"             :rem 156
1681 DATA"{UP}{3 SPACES}(102-105F)OR WRAP
      GENTLY"                     :rem 90
1690 DATA"{UP}{3 RIGHT}IN WARM BLANKETS.
     {SPACE}DO NOT RUB."          :rem 1
1700 DATA"{RVS}5){OFF} DO NOT APPLY HEAT,
      HEAT LAMPS, OR HOT{3 SPACES}WATER B
     OTTLES."                     :rem 165
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1710 DATA"{RVS}6){OFF} ELEVATE AFFECTED P
     ART.","                          :rem 55
1720 DATA"{11 RIGHT}{RVS}EXPOSURE(TO HEAT
     )"                               :rem 10
1730 DATA"{DOWN}{RVS}1){OFF} APPLY COLD W
     ATER OR RUBBING ALCOHOL{5 SPACES}TO
     {SPACE}BARE SKIN."               :rem 47
1740 DATA"{RVS}2){OFF} USE FANS OR AIR CO
     NDITIONING TO{9 SPACES}PROMOTE COOLI
     NG."                             :rem 66
1750 DATA"{RVS}3){OFF} CONTINUE UNTIL TEM
     PERATURE IS REDUCED"             :rem 2
1760 DATA"{RVS}4){OFF} GUARD AGAINST OVER
      CHILLING.",""                   :rem 203
1770 DATA"{15 RIGHT}{RVS}FAINTING":rem 66
1780 DATA"{DOWN}{RVS}1){OFF} PLACE IN LYI
     NG POSITION WITH HEAD{7 SPACES}LOWER
      THAN BODY."                     :rem 143
1790 DATA"{RVS}2){OFF} LOOSEN CLOTHING &
     {SHIFT-SPACE}APPLY COLD CLOTHS."
                                      :rem 191
1800 DATA"{RVS}3){OFF} USE SMELLING SALTS
      & UPON REVIVAL:{6 SPACES}COFFEE, FR
     ESH AIR.",""                     :rem 119
1810 DATA"{16 RIGHT}{RVS}FEVER"  :rem 130
1820 DATA"{DOWN}{RVS}1){OFF} INCREASE FLU
     ID INTAKE."                      :rem 224
1830 DATA"{RVS}2){OFF} DO NOT COVER EXCES
     SIVELY."                         :rem 174
1840 DATA"{RVS}3){OFF} GIVE ASPIRIN OR AC
     ETAMINOPHEN."                    :rem 247
1850 DATA"{RVS}4){OFF} COOLING SPONGES WI
     TH WATER ONLY."                  :rem 134
1860 DATA"{RVS}5){OFF} CALL YOUR DOCTOR."
     ,""                              :rem 3
1870 DATA"{15 RIGHT}{RVS}HEART ATTACK"
                                      :rem 31
1880 DATA"{RVS}1){OFF} CALL HOSPITAL (SPE
     CIFY NEED{13 SPACES}FOR OXYGEN)."
                                      :rem 28
1890 DATA"{RVS}2){OFF} KEEP VICTIM LYING
     {SPACE}DOWN IN A{13 SPACES}COMFORTAB
     LE POSITION."                    :rem 132
1900 DATA"{RVS}3){OFF} ADMINISTER ARTIFIC
     IAL RESPIRATION IF{4 SPACES}BREATHIN
     G HAS STOPPED."                  :rem 140
1910 DATA"{RVS}4){OFF} GIVE CPR IF THERE
     {SPACE}IS NO PULSE{11 SPACES}(IF TRA
     INED)."                          :rem 24
1920 DATA"{RVS}5){OFF} CHECK VICTIM FOR E
     MERGENCY MEDICAL{6 SPACES}INFORMATIO
     N &"                             :rem 55
1930 DATA"{2 UP}{17 RIGHT}PRESCRIPTION FO
     R"                               :rem 195
1940 DATA"{UP}{3 SPACES}MEDICINE. ADMINIS
     TER IF PATIENT IS{6 SPACES}CONSCIOUS
     .","                             :rem 173
1950 DATA"{8 RIGHT}{8 SPACES}{RVS}HERNIAS
     "                                :rem 49
1960 DATA"{DOWN}{RVS}1){OFF} LAY VICTIM O
     N BACK WITH KNEES{11 SPACES}WELL DRA
     WN UP."                          :rem 210
1970 DATA"{RVS}2){OFF} PLACE A CRAVAT BAN
     DAGE AROUND{11 SPACES}THIGHS AND TIE
     ."                               :rem 234
1980 DATA"{RVS}3){OFF} PUT BLANKET UNDER
     {SPACE}KNEES."                   :rem 76
1990 DATA"{RVS}4){OFF} DO NOT TRY TO FORC
     E PROTRUSION{10 SPACES}BACK INTO CAV
     ITY."                            :rem 53
2000 DATA"{RVS}5){OFF} COVER WITH BLANKET
      & TAKE TO HOSPITAL{3 SPACES}IN THIS
      POSITION.",""                   :rem 18
2010 DATA"{16 RIGHT}{RVS}NOSE BLEED"
                                      :rem 148
2020 DATA"{DOWN}{RVS}1){OFF} TIP HEAD FOR
     WARD, BLOW NOSE TO REMOVE{3 SPACES}A
     LL CLOTS."                       :rem 215
2030 DATA"{RVS}2){OFF} SQUEEZE NOSTRILS F
     IRMLY TOGETHER FOR{4 SPACES}10 MINUT
     ES.",""                          :rem 2
2040 DATA"{11 RIGHT}{RVS}POISONING BY GAS
     "                                :rem 161
2050 DATA"{DOWN}{RVS}1){OFF} CALL YOUR DO
     CTOR.","{RVS}2){OFF} OPEN OR BREAK W
     INDOWS."                         :rem 152
2060 DATA"{RVS}3){OFF} SHUT OFF GAS OR ST
     OP MOTOR."                       :rem 198
2070 DATA"{RVS}4){OFF} REMOVE VICTIM TO F
     RESH AIR."                       :rem 231
2080 DATA"{RVS}5){OFF} GIVE ARTIFICIAL RE
     SPIRATION."                      :rem 171
2090 DATA"{RVS}6){OFF} KEEP PATIENT WARM.
     ",""                             :rem 59
2100 DATA"{11 RIGHT}{RVS}POISONING BY MOU
     TH"                              :rem 80
2110 DATA"{DOWN}{RVS}1){OFF} DILUTE POISO
     N WITH WATER OR MILK.{7 SPACES}DISCO
     NTINUE IF"                       :rem 95
2120 DATA"{2 UP}{18 RIGHT}NAUSEATED."
                                      :rem 23
2130 DATA"{RVS}2){OFF} GET MEDICAL HELP &
      CALL POISON{10 SPACES}CONTROL CENTE
     R"                               :rem 23
2140 DATA"{2 UP}{18 RIGHT}IMMEDIATLY."
                                      :rem 110
2150 DATA"{RVS}3){OFF} DO NOT INDUCE VOMI
     TING UNLESS SO{8 SPACES}ADVISED BY P
     OISON"                           :rem 190
2160 DATA"{2 UP}{21 RIGHT}CONTROL CENTER.
     "                                :rem 186
2170 DATA"{RVS}4){OFF} DO NOT NEUTRALIZE.
      DO NOT GIVE OLIVE{4 SPACES}OIL OR O
     THER OILS."                      :rem 120
2180 DATA"{RVS}5){OFF} KEEP AIRWAY OPEN.
     {SPACE}ADMINISTER{12 SPACES}ARTIFICI
     AL RESPIRATION"                  :rem 149
2190 DATA"{2 UP}{26 RIGHT}IF NEEDED."
                                      :rem 160
2200 DATA"{RVS}6){OFF} TREAT FOR SHOCK."
                                      :rem 50
2210 DATA"{RVS}7){OFF} SAVE LABEL, CONTAI
     NER OR VOMITUS.",""              :rem 251
2220 DATA"{17 RIGHT}{RVS}SHOCK{DOWN}"
                                      :rem 172
2230 DATA"{RVS}1){OFF} KEEP VICTIM LYING
     {SPACE}DOWN."                    :rem 253
2240 DATA"{RVS}2){OFF} IF HEAD AND/OR CHE
     ST INJURY, RAISE{6 SPACES}HEAD & SHO
     ULDERS."                         :rem 128
2250 DATA"{RVS}3){OFF} IF IT WILL NOT AGG
     RAVATE ANY INJURY,{4 SPACES}RAISE FE
     ET."                             :rem 201
2260 DATA"{RVS}4){OFF} KEEP PATIENT WARM,
      PREVENT LOSS OF{6 SPACES}BODY HEAT.
     "                                :rem 62
2270 DATA"{RVS}5){OFF} TREAT FOR BREATH S
     TOPPAGE, BLEEDING,{4 SPACES}PAIN."
                                      :rem 147
2280 DATA"{RVS}6){OFF} GET PROMPT MEDICAL
```

```
     ASSISTANCE.",""                    :rem 106
2290 DATA"{8 RIGHT}{7 SPACES}{RVS}SPRAINS
     "                                  :rem 69
2300 DATA"{DOWN}{RVS}1){OFF} ELEVATE INJU
     RED AREA; PLACE AT{10 SPACES}COMPLET
     E REST."                           :rem 92
2310 DATA"{RVS}2){OFF} APPLY ICE BAG, COL
     D CLOTH, OR{11 SPACES}CHEMICAL COLD
     {SPACE}PACK."                      :rem 126
2320 DATA"{RVS}3){OFF} IF SWELLING & PAIN
      CONTINUE SEE{9 SPACES}DOCTOR.",""
                                        :rem 18
2330 DATA"{7 RIGHT}{7 SPACES}{RVS}STRAINS
     "                                  :rem 39
2340 DATA"{DOWN}{RVS}1){OFF} GET VICTIM C
     OMFORTABLE."                       :rem 62
2350 DATA"{RVS}2){OFF} APPLY HOT, WET TOW
     EL."                               :rem 109
2360 DATA"{RVS}3){OFF} KEEP INJURED AREA
     {SPACE}AT REST."                   :rem 121
2370 DATA"{RVS}4){OFF} GET MEDICAL ATTENT
     ION."                              :rem 222
2380 DATA""                             :rem 43
2382 DATA"{16 RIGHT}{RVS}STROKE"        :rem 231
2385 DATA"{RVS}1){OFF} COLD CLOTH ON FORE
     HEAD."                             :rem 211
2390 DATA"{RVS}2){OFF} TURN HEAD OF VOMIT
     ING PATIENT TO{8 SPACES}SIDE."
                                        :rem 147
2400 DATA"{RVS}3){OFF} GIVE NO STIMULANTS
      AND NOTHING BY{7 SPACES}MOUTH."
                                        :rem 64
2410 DATA"{RVS}4){OFF} CALL YOUR DOCTOR."
                                        :rem 138
2420 DATA""                             :rem 38
2430 DATA"{15 RIGHT}{RVS}SUNBURN","{RVS}
     {DOWN}1){OFF} APPLY BURN CREAM OR PE
     TROLEUM JELLY."                    :rem 201
2440 DATA"{RVS}2){OFF} CALL DOCTOR IF FEV
     ER, CHILLS, AND{7 SPACES}SICKNESS OC
     CUR."                              :rem 12
2450 DATA"{RVS}3){OFF} PROTECT REDNESS FR
     OM FURTHER SUN.",""                :rem 70
2460 DATA"{15 RIGHT}{RVS}SUNSTROKE","
     {RVS}{DOWN}1){OFF} CALL YOUR DOCTOR.
     "
                                        :rem 160
2470 DATA"{RVS}2){OFF} MOVE PATIENT TO A
     {SPACE}COOL, SHADY SPOT."          :rem 160
2480 DATA"{RVS}3){OFF} SPONGE ENTIRE BODY
      WITH COLD WATER."                 :rem 252
2490 DATA"{RVS}4){OFF} DO NOT GIVE STIMUL
     ANTS.",""                          :rem 143
2500 DATA"{13 RIGHT}{RVS}TOOTHACHE","
     {DOWN}{RVS}1){OFF} NO TREATMENT."
                                        :rem 77
2510 DATA"{RVS}2){OFF} APPLY COLD COMPRES
     SES UNTIL YOU GET{5 SPACES}TO THE DE
     NTIST.",""                         :rem 119
2520 DATA"9"                            :rem 96
```

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Quiz Master

(Article on page 80.)

Program 1: Quiz Generator

```
10 REM QUIZ MASTER GENERATOR
20 DIMQ$(100),A$(100),B$(100),C$(100),D$(
   100),E$(100),M$(15)              :rem 48
30 PRINT"{WHT}":POKE53280,13:POKE53281,5:
   GOTO50                           :rem 217
40 POKE198,6:POKE631,30:POKE632,34:POKE63
   3,34:POKE634,20:POKE635,5:RETURN
                                    :rem 110
50 POKE53272,23:GOTO970             :rem 59
60 PRINT"{CLR}":CLR                 :rem 229
70 DIMQ$(100),A$(100),B$(100),C$(100),D$(
   100),E$(100),M$(15),SN$(400),G(400)
                                    :rem 99
80 GOSUB1830:GOSUB1360:GOSUB2070    :rem 187
90 PRINT"ENTER NUMBER OF TEST TO LOAD:":I
   NPUTN                            :rem 235
100 IFN<0ORN>XTHENPRINT"INVALID RANGE":GO
    TO90                            :rem 175
110 N$=M$(N):PRINTSPC(12)"{CLR}{RVS}
    {6 DOWN}{9 RIGHT}{3 SPACES}LOADING
    {SHIFT-SPACE}DATA{3 SHIFT-SPACE}"
                                    :rem 30
120 GOSUB1830:GOSUB2150:OPEN2,8,2,+N$+" F
    ILE,S,R":X=0                    :rem 21
130 X=X+1                           :rem 221
140 INPUT#2,Q$(X):INPUT#2,A$(X):INPUT#2,B
    $(X):INPUT#2,C$(X):INPUT#2,D$(X):INPU
    T#2,E$(X)                       :rem 139
150 IFST AND64THEN170               :rem 208
160 GOTO130                         :rem 100
170 CLOSE2:POKE198,0:L=X:N=X:T=0    :rem 218
180 IFR=1THEN240                    :rem 173
190 GOSUB2150:GOSUB2070:GOSUB1670:rem 237
200 IFH=0THEN970                    :rem 165
210 IFH=1THEN240                    :rem 157
220 REM INPUT QUESTIONS             :rem 211
230 PRINT"{CLR}{DOWN}ENTER NAME FOR QUIZ"
    :INPUTN$:GOSUB1460:N=0          :rem 15
240 N=N+1:PRINT"{CLR}":PRINTSPC(13)"{RVS}
     QUIZ MASTER {OFF}"             :rem 200
250 PRINT:PRINT"{RVS} WARNING!{2 SPACES}D
    O NOT EXCEED 80 CHARACTERS{2 SPACES}"
                                    :rem 114
260 PRINT:PRINT"{RVS}{7 SPACES}ENTER £ T
    O EXIT ROUTINE{10 SPACES}"      :rem 159
270 IFN>=100THENPRINT"{CLR}{5 DOWN}
    {14 SPACES}FILE{SHIFT-SPACE}FULL":FOR
    T=1TO2000:NEXT:GOTO980          :rem 50
280 GOSUB40                         :rem 126
290 H=0                             :rem 80
300 PRINT"ENTER QUESTION #";N:PRINT
                                    :rem 205
310 INPUTQ$(N)                      :rem 56
320 IFQ$(N)=""THEN310               :rem 124
330 IFQ$(N)=CHR$(92)THENN=N-1:GOTO770
                                    :rem 170
340 IFLEN(Q$(N))>80THENGOSUB1290    :rem 139
350 IFH=1THEN240                    :rem 162
360 PRINT"ENTER FIRST ANSWER:":PRINT:GOSU
    B40:H=0                         :rem 206
370 INPUT"A. ";A$(N):IFA$(N)=""THEN370
                                    :rem 51
380 IFASC(A$(N))=92THENN=N-1:GOTO770
                                    :rem 117
```

```
390 A$(N)="A. "+A$(N)                    :rem 191
400 IFLEN(A$(N))>80THENGOSUB1290         :rem 120
410 IFH=1THENGOTO360                     :rem 219
420 PRINT"ENTER SECOND ANSWER:":PRINT:GOS
    UB40:H=0                             :rem 255
430 INPUT"B. ";B$(N):IFB$(N)=""THEN430
                                         :rem 48
440 IFASC(B$(N))=92THENN=N-1:GOTO770
                                         :rem 115
450 B$(N)="B. "+B$(N)                    :rem 191
460 IFLEN(B$(N))>80THENGOSUB1290         :rem 127
470 IFH=1THENGOTO420                     :rem 222
480 PRINT"ENTER THIRD ANSWER:":PRINT:GOSU
    B40:H=0                              :rem 196
490 INPUT"C. ";C$(N):IFC$(N)=""THEN490
                                         :rem 63
500 IFASC(C$(N))=92THENN=N-1:GOTO770
                                         :rem 113
510 C$(N)="C. "+C$(N)                    :rem 191
520 IFLEN(C$(N))>80THENGOSUB1290         :rem 125
530 IFH=1THENGOTO480                     :rem 225
540 PRINT"ENTER FOURTH ANSWER:":PRINT:GOS
    UB40:H=0                             :rem 30
550 INPUT"D. ";D$(N):IFD$(N)=""THEN550
                                         :rem 60
560 IFASC(D$(N))=92THENN=N-1:GOTO770
                                         :rem 120
570 D$(N)="D. "+D$(N)                    :rem 200
580 IFLEN(D$(N))>80THENGOSUB1290         :rem 132
590 IFH=1THENGOTO540                     :rem 228
600 PRINT"ENTER LETTER OF CORRECT ANSWER:
    ":PRINT:H=0                          :rem 28
610 INPUTE$(N):IFE$(N)=""THEN610         :rem 71
620 IFASC(E$(N))=92THENN=N-1:GOSUB770:GOT
    O990                                 :rem 210
630 IFLEN(E$(N))<>1THENGOSUB1290         :rem 134
640 IFE$(N)="A"THEN690                   :rem 193
650 IFE$(N)="B"THEN690                   :rem 195
660 IFE$(N)="C"THEN690                   :rem 197
670 IFE$(N)="D"THEN690                   :rem 199
680 PRINT"{RVS} ERROR: RE-ENTER":GOTO610
                                         :rem 17
690 IFH=1THEN600                         :rem 169
700 IFP=1THENRETURN                      :rem 243
710 L=N:GOSUB2070:IFN=100THEN730         :rem 160
720 GOTO240                              :rem 104
730 PRINT:PRINTSPC(7)"FILE CONTAINS 100 E
    NTRIES."                             :rem 248
740 PRINT:PRINT"DATA WILL BE STORED. OPEN
     NEW TEXT FILE"                      :rem 140
750 GOSUB1720:GOSUB770:GOTO990           :rem 83
760 REM STORE DATA                       :rem 40
770 GOSUB2070:PRINTSPC(10)"{RVS} WAIT, ST
    ORING DATA ":GOSUB2150               :rem 63
780 GOSUB1830:OPEN2,8,2,"@0:"+N$+" FILE,S
    ,W"                                  :rem 147
790 FORX=1TOL:PRINT#2,Q$(X):PRINT#2,A$(X)
    :PRINT#2,B$(X):PRINT#2,C$(X):PRINT#2,
    D$(X):PRINT#2,E$(X):NEXT             :rem 211
800 CLOSE2:POKE198,0:GOSUB2150:GOSUB2070:
    GOSUB1670:RETURN                     :rem 78
810 REM CHANGE ANSWER                    :rem 243
820 GOSUB2070:P=1:PRINT"{CLR}{3 DOWN}
    {RVS} ENTER NUMBER OF QUESTION":INPUT
    W                                    :rem 179
830 PRINT"{CLR}{2 DOWN}":S$=Q$(W):GOSUB11
    90:S$=A$(W):GOSUB1190:S$=B$(W):GOSUB1
    190                                  :rem 178
840 S$=C$(W):GOSUB1190:S$=D$(W):GOSUB1190
                                         :rem 103
850 PRINT"CORRECT ANSWER IS:":PRINTE$(W)
                                         :rem 126
860 GOSUB1670:N=W-1:GOSUB240:GOSUB770:RET
    URN                                  :rem 40
870 REM REVIEW ROUTINE                   :rem 123
880 GOSUB2070:Y=1:PRINT"{CLR}{DOWN}"
                                         :rem 153
890 PRINT:PRINTTAB(20-LEN(N$)/2);N$:GOSUB
    1670:PRINT"{2 DOWN}"                 :rem 17
900 FORN=1TOL:PRINT"{CLR}"               :rem 201
910 IFQ$(N)=""THENGOTO960                :rem 197
920 S$=STR$(N)+". "+Q$(N):PRINT:GOSUB1190
                                         :rem 51
930 REM ANSWER CHOICES                   :rem 78
940 S$=A$(N):GOSUB1190:S$=B$(N):GOSUB1190
    :S$=C$(N):GOSUB1190:S$=D$(N):GOSUB119
    0                                    :rem 69
950 PRINT:PRINT"CORRECT ANSWER IS: ":PRIN
    TTAB(7)E$(N):GOSUB2070               :rem 31
960 GOSUB1670:NEXT:RETURN                :rem 128
970 REM PROGRAM MENU                     :rem 209
980 H=0                                  :rem 86
990 PRINT"{CLR}":POKE53280,13:POKE53281,5
                                         :rem 206
1000 GOSUB2070                           :rem 10
1010 P=0                                 :rem 127
1020 PRINTSPC(13)"{DOWN}{RVS} QUIZ
    {SHIFT-SPACE}MASTER "                :rem 7
1030 PRINT:PRINTSPC(5)"ENTER NUMBER OF FU
    NCTION:"                             :rem 196
1040 PRINT:PRINTSPC(8)"1. ENTER NEW QUEST
    IONS"                                :rem 222
1050 PRINT:PRINTSPC(8)"2. REVIEW QUESTION
    S"                                   :rem 202
1060 PRINT:PRINTSPC(8)"3. CHANGE A QUESTI
    ON"                                  :rem 142
1070 PRINT:PRINTSPC(8)"4. LOAD PREVIOUS D
    ATA"                                 :rem 104
1080 PRINT:PRINTSPC(8)"5. ADD TO TEST IN
    {SPACE}FILE"                         :rem 22
1090 PRINT:PRINTSPC(8)"6. INITIALIZE DISK
    "                                    :rem 210
1100 PRINT:PRINTSPC(8)"7. END"           :rem 133
1110 PRINT:PRINTSPC(5)"NUMBER?"          :rem 79
1120 GETG$:IFG$=""THEN1120               :rem 183
1130 G=ASC(G$)-48:IFG<1ORG>8THEN1120
                                         :rem 67
1140 ONGGOSUB230,880,820,60,1640,1730,117
    0                                    :rem 198
1150 GOTO990                             :rem 162
1160 GOSUB2070                           :rem 17
1170 POKE198,0:SYS198                    :rem 209
1180 REM PRINT JUSTIFY                   :rem 105
1190 PRINT                               :rem 88
1200 IFLEN(S$)<40THENPRINTS$:GOTO1280
                                         :rem 10
1210 X=40:Y=1                            :rem 190
1220 X=X-1                               :rem 16
1230 IFASC(MID$(S$,X,Y)+CHR$(0))<>32THEN1
    220                                  :rem 204
1240 PRINTLEFT$(S$,X)                    :rem 239
1250 Z=LEN(S$)                           :rem 6
1260 Z=Z-X                               :rem 63
1270 PRINTRIGHT$(S$,Z)                   :rem 71
1280 RETURN                              :rem 171
1290 PRINT"ENTRY TOO LONG: RE-PHRASE"
                                         :rem 18
1300 H=1:FORT=1TO2000:NEXT:RETURN        :rem 85
1310 REM TEST TITLE FILE                 :rem 139
1320 PRINT:PRINT"HAS TEST TITLE FILE BEEN
     INITIATED?(Y/N)":GOSUB2070          :rem 186
1330 GETG$:IFG$=""THEN1330               :rem 189
1340 IF G$="N"THEN1460                   :rem 139
1350 IFG$<>"Y"THEN1330                   :rem 208
```

```
1360 PRINT:PRINTSPC(17)"{RVS} WAIT "
                                    :rem 72
1370 GOSUB2150:GOSUB1830:OPEN3,8,3,"TEST
     {SPACE}TITLES,S,R"             :rem 125
1380 X=0                            :rem 145
1390 X=X+1:INPUT#3,M$(X)            :rem 124
1400 IFST AND64THEN1420             :rem 46
1410 GOTO1390                       :rem 204
1420 CLOSE3:POKE198,0:GOSUB2150     :rem 89
1430 IFS1<>0THEN2110                :rem 120
1440 PRINT"{CLR}":PRINTSPC(14)"TEST TITLE
     S":PRINT                       :rem 176
1450 FORA=1TOX:PRINTA;". ";M$(A):NEXT:RET
     URN                            :rem 225
1460 REM INITIATE TEST FILE         :rem 102
1470 IFX=15THENGOSUB1710            :rem 206
1480 IF X=15THENX=1                 :rem 76
1490 IFX=1THEN1600                  :rem 25
1500 PRINT"{CLR}HAS FILE OF TEST NAMES BE
     EN STARTED?"                   :rem 95
1510 GETG$:IFG$=""THEN1510          :rem 189
1520 IF G$="N"THEN1600              :rem 135
1530 IFG$="Y"THENGOSUB1370          :rem 23
1540 PRINTX+1". {RVS}"N$            :rem 1
1550 PRINT"IS YOUR TITLE ORIGINAL?"
                                    :rem 29
1560 GETG$:IFG$=""THEN1560          :rem 199
1570 IF G$="Y"THEN1600              :rem 151
1580 PRINT"ENTER NEW TITLE FOR TEST:"
                                    :rem 106
1590 INPUTN$                        :rem 209
1600 M$(X+1)=N$:GOSUB2070           :rem 111
1610 PRINT:PRINTSPC(13)"{RVS} SAVING TITL
     E "                            :rem 87
1620 GOSUB1830:OPEN3,8,3,"@0:TEST TITLES,
     S,W"                           :rem 168
1630 FORA=1TOX+1:PRINT#3,M$(A):NEXT:CLOSE
     3:POKE198,0:GOSUB2150:RETURN   :rem 98
1640 REM TEST ADDITION ROUTINE      :rem 97
1650 CLR                            :rem 173
1660 R=1:GOSUB70:R=0:GOTO990        :rem 188
1670 PRINT:PRINTTAB(5)"{RVS} PRESS
     {SHIFT-SPACE}SPACE{SHIFT-SPACE}BAR
     {SHIFT-SPACE}TO{SHIFT-SPACE}CONTINUE
      {OFF}"                        :rem 61
1680 GETG$:IFASC(G$+CHR$(0))<>32THEN1680
                                    :rem 0
1690 RETURN                         :rem 176
1700 PRINT"{CLR}"                   :rem 44
1710 PRINTSPC(10)"{CLR}{10 DOWN}FILE FULL
     "                              :rem 194
1720 FORT=1TO2000:NEXT:RETURN       :rem 107
1730 PRINT"{CLR}{2 DOWN}{RVS}{2 SPACES}DO
      YOU WANT TO INITIALIZE A NEW DISK?
     {SPACE}":PRINTTAB(17)"{RVS} (Y/N) "
                                    :rem 171
1740 GETG$:IFG$=""THEN1740          :rem 199
1750 IFG$="Y"THENPRINT"TYPE GOTO 1790 AND
      PRESS RETURN":END             :rem 62
1760 IFG$<>"N"THEN1740              :rem 207
1770 IFG$="N"THENRETURN             :rem 167
1780 END                            :rem 167
1790 PRINT"{CLR}{5 DOWN}{6 SPACES}INSERT
     {SPACE}NEW DISK INTO DRIVE     :rem 6
1800 PRINT"{4 DOWN}{2 SPACES}PRESS ANY KE
     Y WHEN READY TO PROCEED"       :rem 8
1810 GOSUB1820:GOTO1850             :rem 86
1820 GETG$:IFG$=""THEN1820          :rem 197
1830 OPEN15,8,15:PRINT#15,"I0:":CLOSE15:R
     ETURN                          :rem 253
1840 END                            :rem 164
1850 REM{2 SPACES}PRINT"{CLR}{5 DOWN}
     {17 RIGHT}{RVS} WAIT1730       :rem 72
1860 PRINT"{2 DOWN}{15 SPACES}{RVS} WARNI
     NG!!!"                         :rem 205
1870 PRINT"{2 SPACES}{RVS} DISK
     {SHIFT-SPACE}IN{SHIFT-SPACE}DRIVE
     {SHIFT-SPACE}IS{SHIFT-SPACE}ABOUT
     {SHIFT-SPACE}TO{SHIFT-SPACE}BE
     {SHIFT-SPACE}ERASED!"          :rem 101
1880 PRINT"{2 SPACES}{RVS}{SHIFT-SPACE}
     {7 SPACES}{SHIFT-SPACE}ARE
     {SHIFT-SPACE}YOU{SHIFT-SPACE}SURE? (
     Y/N){9 SPACES}"                :rem 174
1890 GETG$:IFG$=""THEN1890          :rem 211
1900 IFG$="Y"THEN1930               :rem 154
1910 IFG$="N"THEN990                :rem 101
1920 GOTO1890                       :rem 215
1930 PRINT"{CLR}{2 DOWN}ENTER DISKNAME";:
     INPUTDN$                       :rem 88
1940 IFLEN(DN$)>15THENPRINT"{2 DOWN}NAME
     {SHIFT-SPACE}TOO{SHIFT-SPACE}LONG, T
     RY{SHIFT-SPACE}AGAIN":FORT=1TO1000:N
     EXT:GOTO1930                   :rem 55
1950 PRINT"{2 DOWN}ENTER 2 CHARACTER DISK
      I.D.":INPUTID$                :rem 142
1960 POKE53281,2:POKE53280,2:PRINT"{CLR}
     {5 DOWN}{10 SPACES}LAST{SHIFT-SPACE}
     CHANCE{SHIFT-SPACE}TO{SHIFT-SPACE}ST
     OP!!!"                         :rem 30
1970 PRINT:PRINT"{9 SPACES}PRESS
     {SHIFT-SPACE}ANY{SHIFT-SPACE}KEY
     {SHIFT-SPACE}TO{SHIFT-SPACE}STOP!!!"
     :FORT=1TO1000                  :rem 90
1980 GETG$:IFG$<>""THEN990          :rem 224
1990 NEXT                           :rem 18
2000 PRINT"{CLR}{4 DOWN}DISK{SHIFT-SPACE}
     IS{SHIFT-SPACE}BEING{SHIFT-SPACE}FOR
     MATTED--WAIT"                  :rem 171
2010 OPEN15,8,15:PRINT#15,"N0:"+DN$+","+I
     D$                             :rem 33
2020 INPUT#15,S1,S$,S2,S3:CLOSE15:IFS1<>0
     THEN2110:GOSUB2050             :rem 20
2030 PRINT"{CLR}{10 DOWN}{9 SPACES}DISK
     {SHIFT-SPACE}FORMATTED{SHIFT-SPACE}"
     :FORT=1TO2000:NEXT             :rem 37
2040 POKE53280,13:POKE53281,5:GOTO990
                                    :rem 105
2050 FORT=1TO1000:NEXT:POKE53280,13:POKE5
     3281,5:RETURN                  :rem 47
2060 REM SOUND ROUTINE              :rem 91
2070 S=54272                        :rem 93
2080 POKES,100:POKES+1,125:POKES+5,0:POKE
     S+6,240:POKES+24,15:POKES+4,17
                                    :rem 202
2090 FORT=0TO100:NEXT               :rem 32
2100 POKES+4,0:RETURN               :rem 26
2110 PRINT"DISK{SHIFT-SPACE}ERROR ";S1,S$
     ,S2,S3                         :rem 47
2120 PRINT:PRINT"CORRECT ERROR CONDITION
     {SPACE}AND TRY AGAIN"          :rem 210
2130 GOSUB1670                      :rem 20
2140 GOTO980                        :rem 161
2150 OPEN15,8,15:INPUT#15,S1,S$,S2,S3:CLO
     SE15:IFS1<>0THEN2110           :rem 95
2160 PRINT"DISK STATUS: "S$         :rem 90
2170 RETURN                         :rem 170
```

Program 2: Student Quiz

```
10 REM STUDENT QUIZ
20 PRINT"{CLR}{WHT}":CLR:POKE53280,16:POK
   E53281,16:POKE808,225:POKE649,0:S=5472
   7                                :rem 236
```

```
30 DIMQ$(100),A$(100),B$(100),C$(100),D$(
   100),E$(100),M$(15),A(100)     :rem 128
40 GOSUB840:PRINT"{CLR}{N}":PRINTSPC(12)"
   {RVS}{2 SPACES}LOADING{SHIFT-SPACE}DAT
   A{3 SHIFT-SPACE}":PRINT"{BLK}":GOSUB39
   0:PRINT"{WHT}"                 :rem 252
50 FORX=1TOA:PRINTX". "M$(X):NEXT :rem 26
60 PRINT"{DOWN}ENTER NUMBER OF TEST":POKE
   649,10:INPUTX                  :rem 159
70 IFX<1ORX>ATHENPRINT"INVALID RANGE":GOT
   O60                            :rem 128
80 N$=M$(X):POKE649,0:OPEN15,8,15:PRINT"
   {CLR}":OPEN2,8,2,+N$+" FILE,S,R"
                                  :rem 180
90 PRINT"{9 DOWN}{5 SPACES}LOADING
   {SHIFT-SPACE}";N$;" QUIZ":PRINT"{BLK}"
                                  :rem 1
100 X=0                           :rem 86
110 X=X+1                         :rem 219
120 INPUT#2,Q$(X):INPUT#2,A$(X):INPUT#2,B
    $(X):INPUT#2,C$(X):INPUT#2,D$(X):INPU
    T#2,E$(X)                     :rem 137
130 IFST AND64THEN150             :rem 204
140 GOTO110                       :rem 96
150 CLOSE2:POKE198,0:L=X:CLOSE15:GOSUB920
    :PRINT"{CLR}{WHT}"            :rem 206
160 REM TEST ROUTINE              :rem 225
170 Y=1:POKE649,10:GOSUB540       :rem 75
180 FORN=1TOL-1:PRINT"{CLR}{DOWN}":PRINTT
    AB(20-LEN(N$)/2);N$           :rem 102
190 S$=STR$(N)+". "+Q$(A(N)):PRINT:GOSUB4
    50                            :rem 146
200 REM ANSWER CHOICES            :rem 68
210 S$=A$(A(N)):GOSUB450:S$=B$(A(N)):GOSU
    B450:S$=C$(A(N)):GOSUB450     :rem 225
220 S$=D$(A(N)):GOSUB450:S$=E$(A(N))
                                  :rem 188
230 PRINT"{DOWN}ENTER LETTER OF MOST CORR
    ECT ANSWER:":POKE198,0        :rem 160
240 INPUTF$                       :rem 144
250 IFLEN(F$)<>1THENPRINT"ENTER ONE LETTE
    R ONLY":GOTO240               :rem 102
260 IFASC(F$)<65ORASC(F$)>68THENPRINT"ANS
    WER MUST BE A,B,C, OR D":GOTO240
                                  :rem 151
270 IFASC(F$)=ASC(S$)THENP=P+1    :rem 254
280 IFASC(F$)=ASC(S$)THENPRINTSPC(9)"
    {RVS}{2 SPACES}ANSWER IS CORRECT!! ":
    GOSUB1030                     :rem 215
290 IFASC(F$)<>ASC(S$)THEN:GOSUB1060:GOSU
    B820                          :rem 217
300 FORT=1TO4000:NEXT:NEXT        :rem 149
310 N=N-1                         :rem 203
320 S=INT(P/N*100+.5):PRINT"{CLR}{DOWN}YO
    U SCORED ";S;" %"             :rem 149
330 IFS>80ANDS<90THENPRINT"STUDY THIS SEC
    TION AGAIN"                   :rem 175
340 IFS>=90ANDS<100THENPRINT"VERY GOOD, B
    UT MORE STUDY WOULD HELP"     :rem 214
350 IFS=100THENPRINT"EXCELLENT!!
    {2 SPACES}PERFECT SCORE!!"    :rem 245
360 FORT=1TO3000:NEXT             :rem 33
370 PRINT"{4 DOWN}ENTER RUN TO RE-START P
    ROGRAM":POKE808,237:END       :rem 17
380 REM PRINT JUSTIFY             :rem 58
390 OPEN15,8,15:OPEN3,8,3,"TEST TITLES,S,
    R":PRINT"{BLK}"               :rem 169
400 X=X+1                         :rem 221
410 INPUT#3,M$(X)                 :rem 193
420 IFSTATUSAND64THEN440          :rem 13
430 GOTO400                       :rem 100
440 CLOSE3:POKE198,0:A=X:CLOSE15:PRINT"
    {CLR}{WHT}":RETURN            :rem 139
450 IFLEN(S$)<40THENPRINTS$:GOTO510
                                  :rem 171
460 X=40:Y=1                      :rem 148
470 X=X-1                         :rem 230
480 IFASC(MID$(S$,X,Y)+CHR$(0))<>32THEN47
    0                             :rem 120
490 PRINTLEFT$(S$,X)              :rem 197
500 Z=LEN(S$):Z=Z-X:PRINTRIGHT$(S$,Z)
                                  :rem 58
510 RETURN                        :rem 118
520 PRINT:PRINTSPC(14)"TEST TITLES":PRINT
    :FORA=1TOX:PRINTA;". ";M$(A):NEXT:RET
    URN                           :rem 248
530 REM DISABLE CURSOR CONTROLS   :rem 194
540 IFPEEK(830)=133THEN560        :rem 215
550 FORI=828TO977:READA:POKEI,A:NEXT
                                  :rem 34
560 SYS828:RETURN                 :rem 86
570 DATA169,000,133,252,169,080   :rem 42
580 DATA133,251,169,164,133,002   :rem 38
590 DATA169,083,141,036,003,169   :rem 49
600 DATA003,141,037,003,096,152   :rem 25
610 DATA072,138,072,165,252,208   :rem 42
620 DATA007,032,116,003,169,000   :rem 21
630 DATA133,253,166,253,189,000   :rem 41
640 DATA002,133,254,198,252,230   :rem 36
650 DATA253,104,170,104,168,165   :rem 40
660 DATA254,096,160,000,132,252   :rem 34
670 DATA165,002,032,210,255,169   :rem 37
680 DATA157,032,210,255,032,228   :rem 38
690 DATA255,240,251,164,252,133   :rem 42
700 DATA254,169,032,032,210,255   :rem 33
710 DATA169,157,032,210,255,165   :rem 43
720 DATA254,201,013,240,043,201   :rem 17
730 DATA020,208,013,192,000,240   :rem 18
740 DATA211,136,169,157,032,210   :rem 36
750 DATA255,076,118,003,041,127   :rem 39
760 DATA201,032,144,196,196,251   :rem 44
770 DATA240,192,165,254,153,000   :rem 38
780 DATA002,032,210,255,169,000   :rem 27
790 DATA133,212,200,076,118,003   :rem 30
800 DATA230,252,153,000,002,169   :rem 23
810 DATA032,032,210,255,096,013   :rem 27
820 PRINTSPC(10)"{RVS} SORRY ANSWER IS WR
    ONG "                         :rem 45
830 PRINT"{DOWN}CORRECT CHOICE IS: ";S$:R
    ETURN                         :rem 92
840 PRINT"{CLR}{5 DOWN}":PRINTSPC(13)"
    {RVS} QUIZ MASTER ":POKE53272,23
                                  :rem 31
850 PRINT"{DOWN}{4 SPACES}THESE TESTS ARE
     MULTIPLE CHOICE."            :rem 40
860 PRINT"ENTER THE BEST ANSWER FROM THE
    {SPACE}CHOICES"               :rem 95
870 PRINT"GIVEN."                 :rem 23
880 PRINT"{DOWN}{4 SPACES}ENTER THE NUMBE
    R OF THE TEST YOU "           :rem 221
890 PRINT"HAVE BEEN ASSIGNED WHEN THE PRO
    GRAM "                        :rem 41
900 PRINT"CALLS FOR IT."          :rem 139
910 FORT=1TO6000:NEXT:RETURN      :rem 63
920 REM RANDOM GEN.               :rem 72
930 PRINT"{CLR}{DOWN}WAIT-- PREPARING QUI
    Z":PRINT"{BLK}"               :rem 44
940 FORX=1TOL                     :rem 57
950 A(X)=INT(RND(.)*L)+1          :rem 54
960 IFX=1THEN1000                 :rem 228
970 FORY=1TOX-1                   :rem 167
980 IFA(Y)=A(X)THEN950            :rem 15
990 NEXTY                         :rem 58
1000 NEXTX                        :rem 88
```

```
1010 PRINT"{WHT}":RETURN                :rem 178
1020 REM CORRECT ANSWER SOUND           :rem 18
1030 S=54272:POKES,150:POKES+1,100:POKES+
     5,0:POKES+6,240:POKES+24,15:POKES+4,
     17                                 :rem 144
1040 FORT=0TO200:NEXT:POKES+4,0:RETURN
                                        :rem 172
1050 REM WRONG ANSWER SOUND             :rem 144
1060 S=54272:POKES,150:POKES+1,5:POKES+5,
     0:POKES+6,240:POKES+24,15:POKES+4,17
                                        :rem 55
1070 FORT=0TO200:NEXT:POKES+4,0:RETURN
                                        :rem 175
```

Turtle Graphics Interpreter

(Article on page 90.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: The Interpreter

```
10 REM TURTLE GRAPHICS INTERPRETER
                                        :rem 202
30 IF PEEK(49152)<>173 THEN PRINT CHR$(15
   0) "TURTLE DATA DID NOT LOAD": END
                                        :rem 87
40 X=0: Y=0: IX=0: IY=0: D=0: NU=0: BY=0:
    BI=0: XH=160: XL=-159: C=↑/180
                                        :rem 121
50 CR=.74: YH=INT(79/CR): YL=-YH: BA=2: B
   B=8: BL=320: SC=8192: PE=0: DR=-1
                                        :rem 195
60 MA=7: H=0: PX=53248: BB=8: BL=320: SC=
   8192: PE=0: DR=-1: MA=7: H=0: PX=53248
                                        :rem 33
70 PY=53249: BG=256: RO=0: CO=0: XS=0: YS
   =0: SP=0: PT=2040: SE=53269: HA=.5
                                        :rem 189
80 C1=12: C2=40: C3=50: C4=28: C5=24: C6=
   3: C7=5: CI=360: MX=53264: PC=0:rem 10
90 FF=255: SS=45: SB=56: YM=79          :rem 88
100 DIM ST$(255),ST(255),RP(255),PR$(255)
    ,PN$(255)                           :rem 88
110 DEF FNR(X)=INT((X+.005)*100)/100
                                        :rem 123
120 REM INITIALIZE SCREEN AND TURTLE
                                        :rem 220
130 GOSUB 3000: POKE 2, 110: POKE 53277,
    {SPACE}0: POKE 53271, 0: POKE 53287,0
                                        :rem 146
140 SYS 49295: SYS 49235: SYS 49322: POKE
     SE, 1: POKE 53280,2: POKE53281,11
                                        :rem 63
150 PRINT CHR$(129) "TURTLE GRAPHICS INTE
    RPRETER"                            :rem 218
170 PRINT CHR$(30)                      :rem 218
200 REM MAIN LOOP - GET A LINE OF COMMAND
    S AND PROCESS IT                    :rem 193
210 ST$(0)="": INPUT ST$(0)             :rem 118
220 NE=0: ST(0)=0: RP(0)=0: ER=0        :rem 107
230 IF ST$(0)="" THEN 210               :rem 179
240 REM COPY UNEXECUTED PART OF CURRENT C
    OMMAND STRING (NESTING LEVEL = NE)
                                        :rem 37
250 REM INTO IN$ TO BE PROCESSED        :rem 66
260 IN$=RIGHT$(ST$(NE), LEN(ST$(NE))-ST(N
    E)): IN=0                           :rem 51
270 GOSUB 5000{2 SPACES}FILL WD$ WITH NEX
    T WORD FROM IN$                     :rem 106
280 IF WD$<>"" THEN 350                 :rem 109
290 REM IN$ IS EMPTY; WE ARE DONE WITH AL
    L COMMANDS IF NESTING LEVEL IS 0
                                        :rem 140
300 IF NE=0 THEN 200                    :rem 227
310 REM WE HAVE COMPLETED A REPETITION OF
     THE CURRENT COMMAND STRING ST$(NE)
                                        :rem 55
320 REM IF NEEDED, REPEAT.{2 SPACES}ELSE,
     POP NESTING LEVEL                  :rem 156
330 RP(NE)=RP(NE)-1: IF RP(NE)>0 THEN ST(
    NE)=0: GOTO 240                     :rem 42
340 NE=NE-1: GOTO 240                   :rem 97
350 IF (WD$="REPEAT")OR(WD$="RP") THEN 44
    0                                   :rem 20
360 REM CHECK IF COMMAND IS A PROCEDURE N
    AME                                 :rem 16
370 GOSUB 6000: IF PN=0 THEN 410        :rem 120
380 REM STUFF IN$ WITH PROC STRING AS IF
    {SPACE}IT WERE A REPEAT LOOP        :rem 56
390 IN$= "[" + PR$(PN) + "]" + RIGHT$(IN$
    , LEN(IN$)-IN): IN=0: NU=1          :rem 28
400 ST(NE)=ST(NE)-LEN(PR$(PN))-2: GOTO 48
    0                                   :rem 103
410 REM IDENTIFY AND EXECUTE WD$ AS A COM
    MAND                                :rem 78
420 GOSUB 1000: IF ER THEN 200          :rem 248
430 GOTO 270: REM WE ARE DONE CURRENT COM
    MAND                                :rem 67
440 REM GET REPETITION FACTOR FOR REPEAT
    {SPACE}LOOP                         :rem 0
450 GOSUB 4000: IN$=RIGHT$(IN$, LEN(IN$)-
    IN): IN=0                           :rem 214
460 IF (NOT ER)AND(NU>0)AND(INT(NU)=NU) T
    HEN 480                             :rem 229
470 PRINT "I CAN'T REPEAT SOMETHING " WD$
     " TIMES" :IN$="": GOTO 200         :rem 113
480 REM PUSH THE COMMAND STRING STACK (IN
    CREMENT NESTING LEVEL)              :rem 115
490 NE=NE+1: IF NE=256 THEN PRINT "NESTIN
    G TOO DEEP": GOTO 200               :rem 191
495 RP(NE)=NU: ST(NE)=1: K=0            :rem 45
500 REM FILL ST$(NE) WITH CONTENTS OF REP
    EAT BRACKETS                        :rem 158
510 ST$(NE)="": QQ=0: K=0               :rem 1
520 T$=MID$(IN$, ST(NE), 1)             :rem 106
530 IF T$="]" THEN K=K-1                :rem 221
540 IF K>0 THEN ST$(NE)=ST$(NE)+T$:rem 78
550 IF T$="[" THEN K=K+1: QQ=-1         :rem 82
560 IF K<=0 THEN 600                    :rem 227
570 ST(NE)=ST(NE)+1                     :rem 75
580 IF ST(NE)<=LEN(IN$) THEN 520        :rem 225
590 PRINT "MISMATCHED BRACKETS IN REPEAT"
    : IN$="": GOTO 200                  :rem 112
600 IF (K<0) OR ((K=0)AND(NOTQQ)) THEN 59
    0                                   :rem 172
610 ST(NE-1)=ST(NE)+ST(NE-1): ST(NE)=0
                                        :rem 142
620 GOTO 240: REM EXECUTE THE NEW COMMAND
     STRING                             :rem 57
1000 REM IDENTIFY AND EXECUTE COMMAND
                                        :rem 230
```

```
1005 ER=0                              :rem 202
1010 IF (WD$="FORWARD")OR(WD$="FD") THEN
     {SPACE}GOSUB 9000: RETURN         :rem 69
1020 IF (WD$="RIGHT")OR(WD$="RT") THEN GO
     SUB 10000: RETURN                 :rem 243
1030 IF (WD$="LEFT")OR(WD$="LT") THEN GOS
     UB 11000: RETURN                  :rem 156
1040 IF (WD$="PENUP")OR(WD$="PU") THEN PE
     =-1: RETURN                       :rem 189
1050 IF (WD$="PENDOWN")OR(WD$="PD") THEN
     {SPACE}PE=0: RETURN               :rem 18
1060 IF WD$="HOME" THEN GOSUB 12000: RETU
     RN                                :rem 123
1070 IF WD$="CLEAN" THEN SYS 49295: RETUR
     N                                 :rem 79
1080 IF (WD$="CLEARSCREEN")OR(WD$="CS") T
     HEN GOSUB 12000: SYS 49295: RETURN
                                       :rem 218
1090 IF (WD$="SETHEADING")OR(WD$="SETH")
     {SPACE}THEN GOSUB 13000: RETURN
                                       :rem 233
1100 IF (WD$="SETPOSITION")OR(WD$="SETP")
      THEN GOSUB 14000: RETURN         :rem 111
1110 IF (WD$="PENERASE")OR(WD$="PE") THEN
      DR=0: RETURN                     :rem 73
1120 IF (WD$="PENDRAW")OR(WD$="PW") THEN
     {SPACE}DR=-1: RETURN              :rem 72
1130 IF (WD$="ST")OR(WD$="SHOWTURTLE") TH
     EN POKE SE, 1: RETURN             :rem 76
1140 IF (WD$="HIDETURTLE")OR(WD$="HT") TH
     EN POKE SE, 0: RETURN             :rem 26
1150 IF (WD$="PENCOLOR")OR(WD$="PC") THEN
      GOSUB 15000: RETURN              :rem 205
1160 IF (WD$="BACKGROUNDCOLOR")OR(WD$="BC
     ") THEN GOSUB 16000: RETURN       :rem 190
1170 IF (WD$="TURTLECOLOR")OR(WD$="TC") T
     HEN GOSUB 17000: RETURN           :rem 210
1180 IF WD$="PRINTHEADING" THEN PRINT FNR
     (H): RETURN                       :rem 107
1190 IF WD$="PRINTPOSITION" THEN PRINT "(
     " FNR(X) "," FNR(Y) ")": RETURN
                                       :rem 218
1200 IF WD$="DEFINE" THEN GOSUB 18000: RE
     TURN                              :rem 255
1210 IF WD$="NAMES" THEN GOSUB 19000: RET
     URN                               :rem 202
1220 IF (WD$="PRINTPROCEDURE")OR(WD$="PPR
     OC") THEN GOSUB 20000: RETURN
                                       :rem 140
1230 IF WD$="ERASE" THEN GOSUB 21000: RET
     URN                               :rem 193
1240 IF WD$="ERASEALL" THEN PC=0: PRINT "
     ALL PROCEDURES ERASED": RETURN
                                       :rem 188
1250 IF WD$="RENAME" THEN GOSUB 22000: RE
     TURN                              :rem 12
1260 IF WD$="LOAD" THEN GOSUB 23000: RETU
     RN                                :rem 118
1270 IF WD$="SAVE" THEN GOSUB 24000: RETU
     RN                                :rem 135
1280 IF WD$="SCRATCH" THEN GOSUB 25000: R
     ETURN                             :rem 98
1290 IF WD$="QUIT" THEN PRINT "BYE": END
                                       :rem 207
1300 ER=-1: PRINT "I DON'T UNDERSTAND " W
     D$: RETURN                        :rem 119
2000 REM MOVE TURTLE                   :rem 189
2010 RO=YM-(Y*CR): CO=X-XL             :rem 15
2020 IF (SP/BA)=INT(SP/BA) THEN XS=CO+C1:
      YS=RO+C2: GOTO 2200              :rem 170
2030 XS=CO: IF SP>C6 THEN XS=XS+C5
                                       :rem 199
2050 IF (SP=C6)OR(SP=C7) THEN YS=RO+C4: G
     OTO 2200                          :rem 222
2060 YS=RO+C3                          :rem 243
2200 IF XS<BG THEN POKE PX, XS: POKE MX,
     {SPACE}0: GOTO 2220               :rem 67
2210 POKE PX, XS-BG: POKE MX, 1        :rem 148
2220 POKE PY, YS                       :rem 118
2230 RETURN                            :rem 167
3000 REM CHANGE HEADING                :rem 61
3010 H=H+DH                            :rem 72
3020 IF H>=CI THEN H=H-CI: GOTO 3020
                                       :rem 144
3030 IF H<0 THEN H=H+CI: GOTO 3030
                                       :rem 245
3040 SP=(INT(H/SS+HA)) AND MA:         :rem 160
3050 QQ=PEEK(SE): POKE SE, 0: POKE PT, SB
     +SP: GOSUB 2000                   :rem 42
3065 POKE SE, QQ                       :rem 99
3070 RETURN                            :rem 170
4000 REM NUMERIC INPUT                 :rem 75
4010 REM GETS NEXT WORD FROM IN$ AS A NUM
     BER (NU).{2 SPACES}CHECKS FOR ERROR
                                       :rem 40
4020 GOSUB 5000: ER=0: NU=0: IF WD$="" TH
     EN ER=-1: RETURN                  :rem 23
4030 FOR K= 1 TO LEN(WD$): T$=MID$(WD$, K
     , 1)                              :rem 202
4040 IF ((T$<"0")OR(T$>"9")) AND (T$<>"-"
     )AND(T$<>"+")AND(T$<>".") THEN ER=-1
                                       :rem 59
4050 NEXT: NU=VAL(WD$): RETURN         :rem 47
5000 REM FILL WD$ WITH NEXT WORD FROM IN$
                                       :rem 53
5010 WD$="": IF IN$="" THEN 5070       :rem 6
5020 IN$=RIGHT$(IN$, LEN(IN$)-IN): IN=0
                                       :rem 134
5030 ST(NE)=ST(NE)+1: IN=IN+1          :rem 120
5040 IF IN>LEN(IN$) THEN IN=IN-1: ST(NE)=
     ST(NE)-1: GOTO 5070               :rem 58
5050 IF MID$(IN$, IN, 1)<>" " THEN WD$=WD
     $ + MID$(IN$, IN, 1): GOTO 5030
                                       :rem 187
5060 IF (WD$="")AND(IN$<>"") THEN 5020
                                       :rem 126
5070 RETURN                            :rem 172
6000 REM IDENTIFY PROCEDURE            :rem 175
6010 REM RETURNS INDEX (PN) OF PROCNAME I
     N WD$; 0 IF NOT A PROCNAME        :rem 6
6020 K=0: PN=0                         :rem 197
6030 K=K+1: IF K>PC THEN RETURN        :rem 236
6040 IF WD$<>PN$(K) THEN 6030          :rem 232
6050 PN=K: RETURN                      :rem 11
7000 REM OPEN DISK FILE                :rem 40
7010 ER=0: GOSUB 5000: IF WD$<>"" THEN 70
     30                                :rem 138
7020 ER=-1: PRINT "YOU MUST SUPPLY A FILE
     NAME": RETURN                     :rem 213
7030 OPEN 15,8,15                      :rem 88
7040 OPEN 2,8,2, "0:" + WD$ + ".TURTLE,S,
     " + MD$: INPUT#15, QQ,T$,K,ZZ
                                       :rem 217
7050 IF (QQ=26)AND(MD$="W") THEN PRINT "W
     RITE-PROTECTED DISK": ER=-1: RETURN
                                       :rem 183
7060 IF (QQ=67)AND(MD$="W")AND(K=36) THEN
      PRINT "DISK IS FULL.": ER=-1: RETUR
     N                                 :rem 109
7070 IF (QQ=63)AND(MD$="W") THEN PRINT "F
```

```
     ILENAME IS USED": ER=-1: RETURN
                                        :rem 59
7080 IF (QQ=62)AND(MD$="R") THEN PRINT "N
     O SUCH FILE ON DISK": ER=-1: RETURN
                                        :rem 224
7090 IF QQ>19 THEN PRINT "I'M HAVING TROU
     BLE WITH THE DISK": ER=-1    :rem 244
7100 RETURN                         :rem 168
8000 REM GET VALID COLOR NUMBER     :rem 68
8010 GOSUB 4000 NUMERIC INPUT       :rem 176
8020 IF ER OR (NU>15)OR(NU<0) THEN ER=-1
                                    :rem 139
8030 RETURN                         :rem 171
9000 REM FORWARD COMMAND            :rem 193
9010 GOSUB 4000: IF ER OR (NU<=0) THEN PR
     INT "I CAN'T GO FORWARD " WD$: RETUR
     N                              :rem 198
9020 IX=X: IY=Y: FOR D= 0 TO NU: X=FNR(D*
     SIN(H*C)+IX): Y=FNR(D*COS(H*C)+IY)
                                    :rem 232
9030 IF X>XH THEN X=XH              :rem 245
9040 IF X<XL THEN X=XL              :rem 252
9050 IF Y>YH THEN Y=YH              :rem 251
9060 IF Y<YL THEN Y=YL               :rem 2
9070 IF PE THEN 9120                :rem 239
9080 BY=SC + BL*INT((YM-(Y*CR))/BB) +BB*I
     NT((X-XL)/BB) + ((YM-(Y*CR)) AND MA)
                                    :rem 74
9090 BI=MA - ((X-XL) AND MA)        :rem 129
9100 IF DR THEN POKE BY, PEEK(BY) OR BA↑B
     I: GOTO 9120                   :rem 113
9110 POKE BY, PEEK(BY) AND (FF-BA↑BI)
                                    :rem 27
9120 GOSUB 2000: NEXT: RETURN       :rem 161
10000 REM RIGHT COMMAND             :rem 82
10010 GOSUB 4000: IF ER OR (NU<0) THEN PR
      INT "I CAN'T TURN RIGHT " WD$: RETU
      RN                            :rem 205
10020 DH=NU: GOSUB 3000: RETURN     :rem 246
11000 REM LEFT COMMAND               :rem 0
11010 GOSUB 4000: IF ER OR (NU<0) THEN PR
      INT "I CAN'T GO LEFT " WD$: RETURN
                                    :rem 200
11020 DH=-NU: GOSUB 3000: RETURN     :rem 36
12000 REM HOME COMMAND              :rem 255
12010 X=0: Y=0: H=0: DH=0: GOSUB 3000: RE
      TURN                          :rem 114
13000 REM SETHEADING COMMAND        :rem 179
13010 GOSUB 4000: IF (NOT ER)AND(H<=360)
      {SPACE}THEN 13030             :rem 127
13020 ER=-1: PRINT "I CAN'T SET A HEADING
       OF " WD$: RETURN             :rem 84
13030 H=NU: DH=0: GOSUB 3000: RETURN
                                    :rem 233
14000 REM SETPOSITION COMMAND        :rem 57
14010 GOSUB 4000: IF (NOT ER)AND(NU>=XL)A
      ND(NU<=XH) THEN 14030         :rem 201
14020 ER=-1: PRINT "I CAN'T SET AN X-VALU
      E OF "WD$: RETURN             :rem 181
14030 QQ=NU: GOSUB 4000             :rem 248
14040 IF (NOT ER)AND(NU>=YL)AND(NU<=YH) T
      HEN X=QQ: Y=NU: GOSUB 2000: RETURN
                                    :rem 152
14050 ER=-1: PRINT "I CAN'T SET A Y-VALUE
       OF "WD$: RETURN              :rem 107
15000 REM PENCOLOR COMMAND          :rem 59
15010 GOSUB 8000: IF ER THEN PRINT WD$ "
      {SPACE}IS NOT A PENCOLOR": RETURN
                                    :rem 168
15020 POKE 2, (PEEK(2)AND15)+16*NU: SYS 4
      9235: RETURN                  :rem 112
16000 REM BACKGROUNDCOLOR COMMAND :rem 57
16010 GOSUB 8000: IF ER THEN PRINT WD$ "
      {SPACE}IS NOT A BACKGROUNDCOLOR": R
      ETURN                         :rem 166
16020 POKE 2, (PEEK(2)AND240)+NU: SYS 492
      35: RETURN                    :rem 16
17000 REM TURTLECOLOR COMMAND       :rem 58
17020 GOSUB 8000: IF ER THEN PRINT WD$ "
      {SPACE}IS NOT A TURLTECOLOR": RETUR
      N                             :rem 168
17030 POKE 53287, NU: RETURN        :rem 28
18000 REM DEFINE NEW PROCEDURE      :rem 27
18010 GOSUB 5000:IF WD$<>"" THEN 18030
                                    :rem 176
18020 PRINT "I NEED A PROCEDURE NAME": ER
      =-1: RETURN                   :rem 194
18030 IF PC=FF THEN PRINT"I CAN'T REMEMBE
      R ANY MORE PROCEDURES": ER=-1: RETU
      RN                            :rem 105
18040 GOSUB 6000: IF PN<>0 THEN PRINT WD$
       " ALREADY EXISTS": ER=-1: RETURN
                                    :rem 123
18050 PC=PC+1: PN$(PC)=WD$: PRINT WD$;: I
      NPUT PR$(PC)                  :rem 206
18060 PRINT WD$ " IS NOW DEFINED": RETURN
                                    :rem 40
19000 REM PRINTNAMES COMMAND        :rem 222
19010 PRINT "NUMBER OF PROCEDURES:" PC
                                    :rem 243
19020 IF PC=0 THEN RETURN           :rem 154
19030 FOR K= 1 TO PC: PRINT PN$(K): NEXT:
       RETURN                       :rem 139
20000 REM PRINTPROCEDURE COMMAND    :rem 11
20010 GOSUB 5000: IF WD$<>"" THEN 20030
                                    :rem 162
20020 ER=-1: PRINT "I NEED A PROCEDURE NA
      ME": RETURN                   :rem 187
20030 GOSUB 6000: IF PN<>0 THEN PRINT PR$
      (PN): RETURN                  :rem 215
20040 ER=-1: PRINT "THERE IS NO PROCEDURE
       " WD$: RETURN                :rem 102
21000 REM ERASE COMMAND              :rem 70
21010 GOSUB 5000: IF WD$<>"" THEN 21030
                                    :rem 164
21020 ER=-1: PRINT "I NEED A PROCEDURE NA
      ME": RETURN                   :rem 188
21030 GOSUB6000: IF PN<>0 THEN 21050
                                    :rem 116
21040 ER=-1: PRINT "THERE IS NO PROCEDURE
       " WD$: RETURN                :rem 103
21050 PR$(PN)=PR$(PC): PN$(PN)=PN$(PC): P
      C=PC-1:PRINT WD$ " IS ERASED": RETU
      RN                            :rem 145
22000 REM RENAME COMMAND            :rem 143
22010 GOSUB 5000: IF WD$<>"" THEN 22030
                                    :rem 166
22020 ER=-1: PRINT "I NEED TO KNOW THE OL
      D NAME": RETURN               :rem 117
22030 GOSUB 6000                     :rem 61
22040 IF PN=0 THEN PRINT "PROCEDURE " WD$
       " DOESN'T EXIST": ER=-1: RETURN
                                    :rem 69
22050 QQ=PN                         :rem 118
22060 GOSUB 5000: IF WD$<>"" THEN22080
                                    :rem 176
22070 PRINT "I NEED TO KNOW THE NEW NAME"
      : ER=-1: RETURN               :rem 133
22080 GOSUB 6000                     :rem 66
22090 IF PN<>0 THEN PRINT "YOU HAVE ALREA
      DY USED THAT NAME": ER=-1: RETURN
                                     :rem 0
```

```
22100 PN$(QQ)=WD$: PRINT "RENAMING OK": R
      ETURN                          :rem 182
23000 REM LOAD COMMAND               :rem 248
23010 MD$="R": GOSUB 7000: IF ER THEN 230
      60                             :rem 137
23020 INPUT#2, NP                    :rem 166
23030 IF (NP+PC)>FF THEN PRINT "TOO MANY
      {SPACE}PROCEDURES": ER=-1: GOTO 230
      60                             :rem 251
23040 FOR K= 1 TO NP: INPUT#2, PN$(PC+K),
       PR$(PC+K): NEXT: PC=PC+NP     :rem 108
23050 PRINT NP "PROCEDURES LOADED":rem 14
23060 CLOSE 2: CLOSE 15: RETURN      :rem 211
24000 REM SAVE COMMAND                :rem 8
24010 MD$="W": GOSUB 7000: IF ER THEN 240
      40                             :rem 142
24020 PRINT#2, PC: FOR K= 1 TO PC: PRINT#
      2, PN$(K): PRINT#2, PR$(K): NEXT
                                     :rem 114
24030 PRINT PC "PROCEDURES SAVED":rem 204
24040 CLOSE 2: CLOSE 15: RETURN      :rem 210
25000 REM SCRATCHFILE COMMAND         :rem 2
25010 ER=0: GOSUB 5000: IF WD$<>"" THEN 2
      5030                           :rem 234
25020 PRINT "YOU MUST SUPPLY A FILENAME":
       ER=-1: RETURN                 :rem 5
25030 OPEN 15,8,15                   :rem 136
25040 PRINT#15, "S0:" + WD$ + ".TURTLE":
      {SPACE}INPUT#15, QQ,T$,ZZ,ZZ:rem 42
25050 IF (QQ>19)AND(QQ<>62) THEN PRINT "I
      'M HAVING TROUBLE WITH THE DISK":ER
      =-1                            :rem 25
25060 CLOSE 15: RETURN               :rem 243
```

Program 2: Turtle Data

```
100 REM TURTLE DATA, FOR USE WITH TURTLE
    {SPACE}GRAPHICS INTERPRETER. USE TURT
    LE BOOT                          :rem 95
110 REM TO LOAD.                     :rem 103
120 FOR K= 3584 TO 4095: READ J: POKE K,
    {SPACE}J: NEXT                   :rem 142
200 REM HEADING 0                    :rem 150
210 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,24,0,0
                                     :rem 239
220 DATA 60,0,0,126,0,0,255,0,1,255,128,3
    ,255,192,7,255,224,15,255,240,31,255
                                     :rem 171
230 DATA 248,0,0,0,0,0,0,0           :rem 209
240 REM HEADING 45                   :rem 211
250 DATA 0,63,255,0,31,255,0,15,255,0,7,2
    55,0,3,255,0,1,255,0,0,127,0,0,63,0
                                     :rem 90
260 DATA 0,31,0,0,7,0,0,3,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                     :rem 252
270 DATA 0,0,0,0,0                    :rem 83
280 REM HEADING 90                   :rem 215
290 DATA 0,0,0,0,0,0,0,224,0,0,240,0,0,248,
    0,0,254,0,0,255,0,0,255,128,0,255,192
                                     :rem 163
300 DATA 0,255,224,0,255,224,0,255,192,0,
    255,128,0,255,0,0,254,0,0,248,0,0,240
                                     :rem 199
310 DATA 0,0,224,0,0,0,0,0,0,0,0,0,0,0,0
                                     :rem 78
320 REM HEADING 135                   :rem 2
330 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,0,0
                                     :rem 27
340 DATA 7,0,0,31,0,0,63,0,0,127,0,1,255,
    0,3,255,0,7,255,0,15,255,0,31,255,0
                                     :rem 76
350 DATA 63,255,0                    :rem 63
360 REM HEADING 180                   :rem 6
370 DATA 0,0,0,31,255,248,15,255,240,7,25
    5,224,3,255,192,1,255,128,0,255,0,0
                                     :rem 128
380 DATA 126,0,0,60,0,0,24,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                     :rem 58
390 DATA 0,0,0,0,0,0,0,0,0           :rem 198
400 REM HEADING 235                   :rem 2
410 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,192,0,0
                                     :rem 203
420 DATA 224,0,0,248,0,0,252,0,0,254,0,0,
    255,128,0,255,192,0,255,224,0,255,240
                                     :rem 199
430 DATA 0,255,248,0,255,252,0,0     :rem 20
440 REM HEADING 270                   :rem 5
450 DATA 0,0,0,0,0,0,0,0,0,14,0,0,30,0,0,62
    ,0,0,254,0,1,254,0,3,254,0,7,254,0,15
                                     :rem 128
460 DATA 254,0,15,254,0,7,254,0,3,254,0,1
    ,254,0,0,254,0,0,62,0,0,30,0,0,14,0,0
                                     :rem 159
470 DATA 0,0,0,0,0,0,0,0,0           :rem 105
480 REM HEADING 315                   :rem 9
490 DATA 255,252,0,255,248,0,255,240,0,25
    5,224,0,255,192,0,255,128,0,254,0,0
                                     :rem 134
500 DATA 252,0,0,248,0,0,224,0,0,192,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                     :rem 82
510 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0 :rem 212
600 REM SPLITSCREEN ROUTINE          :rem 236
610 FOR K= 49152 TO 49349: READ J: POKE K
    , J: NEXT                        :rem 254
620 DATA 173,25,208,141,25,208,41,1,208,3
    ,76,188,254,173,18,208,16,18,169,21
                                     :rem 166
630 DATA 141,24,208,169,27,141,17,208,169
    ,1,141,18,208,76,188,254,169,25,141
                                     :rem 178
640 DATA 24,208,169,59,141,17,208,169,209
    ,141,18,208,24,165,214,105,236,16
                                     :rem 75
650 DATA 3,32,83,192,165,197,201,4,208,3,
    238,32,208,201,5,208,3,238,33,208,32
                                     :rem 200
660 DATA 132,192,76,49,234,165,2,162,0,15
    7,0,4,232,208,250,157,0,5,232,208,250
                                     :rem 245
670 DATA 157,0,6,232,208,250,162,31,157,0
    ,7,202,16,250,169,32,162,201,157,31,7
                                     :rem 238
680 DATA 202,208,250,24,160,0,162,20,32,2
    40,255,96,162,39,165,2,157,248,6,202
                                     :rem 199
690 DATA 16,250,96,24,169,32,133,252,169,
    0,133,251,168,145,251,200,208,251,230
                                      :rem 2
700 DATA 252,165,252,201,64,208,1,96,152,
    240,239,120,169,127,141,13,220,169,1
                                     :rem 198
710 DATA 141,26,208,169,192,141,21,3,169,
    0,141,20,3,169,1,141,18,208,88,96
                                     :rem 58
```

Program 3: Turtle Boot

```
10 REM TURTLE BOOT                          :rem 89
20 POKE 53281, 6                            :rem 246
30 PRINT CHR$(147); CHR$(154) TAB(10) "TU
   RTLE GRAPHICS BOOT": PRINT: PRINT
                                            :rem 197
40 PRINT "THIS PROGRAM WILL LOAD AND RUN
   {SPACE}THE"                              :rem 134
50 PRINT "TURTLE DATA AND INTERPRETER PRO
   GRAMS.": PRINT                           :rem 183
60 PRINT "WHILE THEY ARE LOADING THE SCRE
   EN WILL"                                 :rem 153
70 PRINT "BLANK.": PRINT                    :rem 149
80 PRINT "DO NOT REMOVE THE DISK UNTIL TH
   E"                                       :rem 4
90 PRINT "INTERPRETER PROMPTS YOU FOR YOU
   R FIRST"                                 :rem 126
100 PRINT "COMMAND.": PRINT: PRINT: POKE
    {SPACE}198, 0                           :rem 132
110 PRINT "PRESS " CHR$(18) "SPACE" CHR$(
    146) " WHEN READY"                      :rem 51
120 GETA$: IF A$="" THEN 120                :rem 73
130 Q$=CHR$(34): D$=CHR$(17)                :rem 152
140 PRINT CHR$(147); CHR$(31); D$; D$; D$
     "POKE 16384, 0: POKE 44, 64: NEW"
                                            :rem 74
150 PRINT D$; D$ "LOAD" Q$ "TURTLE GRAPHI
    C 2" Q$ ",8"                            :rem 120
160 PRINT D$; D$; D$; D$; D$ "RUN":rem 81
170 PRINT D$; D$ "LOAD" Q$ "TURTLE GRAPHI
    C 1" Q$ ",8"                            :rem 121
180 PRINT D$; D$; D$; D$; D$ "RUN" CHR$(1
    9)                                      :rem 15
190 FOR K= 1 TO 7: POKE 630+K, 13: NEXT:
    {SPACE}POKE 198, 7                      :rem 3
```

Teaching Your Computer English

(Article on page 126.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
1 SYS65517:AA=PEEK(781):GOTO62      :rem 34
2 DIML(35),M(6,6),N$(35),R$(6):FORX=1TO6:
  FORY=1TO6:READM(X,Y):NEXTY,X      :rem 155
3 FORX=1TO29:READN$(X):NEXT:FORX=1TO29:RE
  ADL(X):NEXT:FORX=1TO6:READR$(X):NEXT
                                    :rem 63
4 L=2                               :rem 239
5 L5=36879:IFAA=40THENL5=53281      :rem 224
6 IFL=1THENPOKEL5,104:PRINT"{WHT}":rem 47
7 IFL=2THENPOKEL5,125:PRINT"{BLK}"
                                    :rem 191
8 IFL=3THENPOKEL5,62:PRINT"{BLK}":rem 145
9 IFL=4THENPOKEL5,47:PRINT"{BLK}":rem 150
10 IFL=5THENPOKEL5,11:PRINT"{WHT}":rem 43
11 IFL=6THENPOKEL5,94:PRINT"{BLK}"
                                    :rem 195
12 PRINT"{CLR}EEEEEEEEEEEEEEEEEEEEE":PRI
   NT"YOU ARE IN THE":PRINTR$(L)    :rem 231
13 PRINT"YOU CAN SEE"               :rem 225
14 FORX=1TO29:IFL(X)=LTHENPRINTN$(X)
                                    :rem 62
15 NEXT                             :rem 165
16 PRINT"EEEEEEEEEEEEEEEEEEEEE":GOTO66
                                    :rem 5
17 PRINT"WHAT IS YOUR":INPUT"COMMAND";A$
                                    :rem 5
18 FORX=1TOLEN(A$):IFMID$(A$,X,1)=" "ANDL
   EN(A$)>X+1THENB$=MID$(A$,X+1,2):rem 75
19 NEXT                             :rem 169
20 IFLEN(A$)>1THENA$=LEFT$(A$,2)    :rem 41
21 V$="GOGEPUTAHIINLO"              :rem 125
22 N$="NOSOEAWEUPDOBECHTAPITHSEGRMUBUARSW
   SHMASPOIDRTRLEBONECARISP"        :rem 138
23 FORY=1TOLEN(V$):IFMID$(V$,Y,2)=A$THENV
   =Y+1:V=V/2                       :rem 114
24 NEXT:FORX=1TOLEN(N$):IFMID$(N$,X,2)=B$
   THENN=X+1:N=N/2                  :rem 194
25 NEXT:ONVGOTO26,29,39,29,46,53,55,39
                                    :rem 146
26 IFN>6THENPRINT"YOU CAN'T":GOTO17
                                    :rem 222
27 FORX=1TO6:IFN=XANDM(L,N)>0THENL=M(L,N)
                                    :rem 92
28 NEXT:GOTO5                       :rem 81
29 IFN=7ORN=9ORN=11THENPRINT"YOU CAN'T":P
   RINT"EEEEEEEEEEEEEEEEEEEEE":GOTO17
                                    :rem 205
30 IFN=14ORN=15ORN=22ORN=23THENPRINT"YOU
   {SPACE}CAN'T":PRINT"EEEEEEEEEEEEEEEEEE
   EEE"                             :rem 216
31 IFN=14ORN=15ORN=22ORN=23THEN17    :rem 45
32 IFB$="AR"THENL(16)=0              :rem 14
33 IFN=24THENPRINT"YOU CAN'T":PRINT"EEEEE
   EEEEEEEEEEEEEEEE":GOTO17         :rem 4
34 IFN=26THENPRINT"CAN'T, IT RAN AWAY":PR
   INT"EEEEEEEEEEEEEEEEEEEEE":L(26)=10
                                    :rem 232
35 IFN=26THEN17                     :rem 129
36 IFN=27THENPRINT"TOO HOT":PRINT"EEEEEEE
   EEEEEEEEEEEEEEE":GOTO17          :rem 157
37 FORX=7TO29:IFN=XANDL(X)=LTHENL(X)=0
                                    :rem 185
38 NEXT:GOTO5                       :rem 82
39 IFN=24ANDL=5ANDL(23)=10THENPRINT"{CLR}
   YOU MADE IT!!":END               :rem 135
40 IFL=5ANDL(23)=LANDN=24THENPRINT"{CLR}
   {3 DOWN}TROLL PUTS YOU":PRINT"IN THE D
   UNGEON."                         :rem 48
41 IFL=5ANDL(23)=LANDN=24THENPRINT"
   {2 DOWN}{3 SPACES}GAME OVER":END
                                    :rem 93
42 FORX=1TO29:IFN=XANDL(N)<>0THENNEXT
                                    :rem 163
43 IFL(N)<>0THENPRINT"DON'T HAVE IT":PRIN
   T"EEEEEEEEEEEEEEEEEEEEE":GOTO17
                                    :rem 124
44 FORX=1TO29:IFN=XANDL(X)=0THENL(X)=L
                                    :rem 177
45 NEXT:PRINT"EEEEEEEEEEEEEEEEEEEEE":GOT
   O17                              :rem 124
46 IFL<>5ORN<>23THENPRINT"{DOWN}HURT YOUR
    HAND{DOWN}":GOTO17              :rem 108
47 IFL=5ANDN=23ANDL(17)<>0THENPRINT"
   {DOWN}HURT YOUR HAND{DOWN}"      :rem 204
48 IFL=5ANDN=23ANDL(17)=0ANDL(28)<>0THENP
   RINT"{DOWN}YOU CAN'T{DOWN}"      :rem 177
49 IFL=5ANDN=23ANDL(17)=0ANDL(28)=0ANDL(2
   5)<>0THENPRINT"{DOWN}YOU CAN'T"
                                    :rem 229
```

```
50 IFL=5ANDN=23ANDL(17)=0ANDL(28)=0ANDL(2
   5)=0THENPRINT"{DOWN}THE TROLL FLEES
   {DOWN}"                              :rem 68
51 IFL=5ANDN=23ANDL(17)=0ANDL(28)=0ANDL(2
   5)=0THENL(23)=10                     :rem 21
52 GOTO17                               :rem 8
53 PRINT"{CLR}{DOWN}YOU ARE CARRYING
   {DOWN}":FORX=1TO29:IFL(X)=0THENPRINTN$
   (X)"{DOWN}"                          :rem 110
54 NEXT:FORI=1TO1500:NEXT:GOTO6         :rem 11
55 IFN=9ANDL=1THENL(28)=L:GOTO12        :rem 223
56 IFN<>14THEN59                        :rem 196
57 PRINT"{DOWN}THE KEY TO WHAT YOU":PRINT
   "SEEK IS HIDDEN WHERE"               :rem 226
58 PRINT"THE KING SLEEPS{DOWN}":GOTO17
                                        :rem 0
59 PRINT"{DOWN}YOU CAN SEE{DOWN}":FORX=1T
   O29:IFN=XANDL(X)=L THEN61            :rem 149
60 FORX=1TO29:IFN=XANDL(X)=L THEN61
                                        :rem 180
61 NEXT:FORI=1TO1000:NEXT:GOTO12        :rem 49
62 PRINT"{CLR}{BLK}YOU ARE IN A CASTLE":P
   RINT"GUARDED BY AN EVIL"             :rem 38
63 PRINT"TROLL.":PRINT"{DOWN}CAN YOU GET
   {SPACE}OUT?":PRINT"{2 DOWN}HIT ANY KEY
   "                                    :rem 218
64 GETZ$:IFZ$=""THEN64                  :rem 41
65 GOTO2                                :rem 214
66 PRINT"EXITS ARE:":FORY=1TO6:IFM(L,Y)>0
   THENPRINTN$(Y)                       :rem 27
67 NEXT:PRINT"EEEEEEEEEEEEEEEEEEEEE":GOT
   O17                                  :rem 128
68 REM M(X)                             :rem 72
69 DATA0,,,3,,2,4,5,6,,1,,,,1,,,6,,2,,,,,
   2,0,,,,,,,,2,3,0                     :rem 130
70 REM N$(X)                            :rem 102
71 DATA"NORTH","SOUTH","EAST","WEST","UP"
   ,"DOWN"                              :rem 97
72 DATA"BED","CHAIR","TABLE","PILLOW","TH
   RONE","SCEPTER","GRAIL","MURAL":rem 30
73 DATA"BUNK","ARMOR","SWORD","SHIELD","M
   ACE","SPEARS","OIL","DRAWBRIDGE"
                                        :rem 116
74 DATA"TROLL","DRAWBRIDGE LEVER","SPELL
   {SPACE}BOOK","EYE OF NEWT","CAULDRON"
                                        :rem 40
75 DATA"RING","SPELL"                   :rem 234
76 REM L(X)                             :rem 70
77 DATA10,10,10,10,10,10                :rem 170
78 DATA1,1,1,1,2,2,2,2,3,3,3,3,4,4,4,5,5,
   5,6,6,6,10,10                        :rem 72
79 REM R$(X)                            :rem 115
80 DATA"KINGS BEDROOM","THRONE ROOM","KNI
   GHTS QUARTERS","ARMORY"              :rem 16
81 DATA"DRAWBRIDGE ROOM","SORCERER'S ROOM
   "                                    :rem 107
```

Trek

(Article on page 54.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
10 POKE53280,6:POKE53281,0:PRINT"{GRN}"
                                        :rem 229
11 PRINT"{CLR}{17 SPACES}{10 DOWN}TREK"
                                        :rem 166
12 PRINT"{9 DOWN}{14 SPACES}PLEASE WAIT"
                                        :rem 188
13 GOSUB 5000                           :rem 169
14 PRINT"{11 SPACES}{2 DOWN}SKILL
   {2 SPACES}LEVEL (1-4) "              :rem 50
18 GETFQ$:IF FQ$<"1"OR FQ$>"4" THEN 18
                                        :rem 227
19 FQ=VAL(FQ$):PRINT"{CLR}"             :rem 203
20 GOSUB 500                            :rem 119
30 GOSUB 800                            :rem 123
35 GOSUB 880                            :rem 136
40 V=53248:POKE723,10:V1=2040:SS=0:EX=80:
   TI$="140000":POKE53275,48:BSC=0:rem 67
45 XX$={2 SPACES}"{HOME}{23 DOWN}":rem 88
50 POKE V+21,63                         :rem 13
60 POKEV1,215:POKEV1+1,215:POKEV1+2,215:P
   OKEV1+3,211:POKEV1+4,212:POKEV1+5,213
                                        :rem 49
70 POKEV+39,6:POKEV+40,10:POKEV+41,5:POKE
   V+42,15:POKEV+43,9:POKEV+44,9        :rem 191
80 POKE V+9,202:POKEV+11,202            :rem 29
90 GOSUB 900                            :rem 130
95 QI=.01:POKEV+6,80:E=100:POKEV+5,145:PO
   KEV+29,8:POKE53280,0:IFFQ>2THENQI=.06
                                        :rem 164
96 POKE 2046,214:POKE53293,10:POKEV+30,0
                                        :rem 210
97 POKE V+1,150:POKEV+3,155:POKEV+5,160:P
   OKEV+7,180:EP=180:POKE650,128:HIT=0
                                        :rem 187
99 SS=.1:EX=80:S=54272:POKE54296,9:POKES+
   5,9:POKES+6,0:POKES,240:POKES+1,33
                                        :rem 248
100 SYS 989:POKE53277,PEEK(53277)OR(2↑4):
    POKE53277,PEEK(53277)OR(2↑5)        :rem 221
110 SYS THRST:POKE53280,0:POKEV+7,PEEK(V+
    7)+1:IF PEEK(V+7)>185THEN POKEV+7,185
                                        :rem 119
112 SYS THRST:POKE49402,PEEK(V+30):SYS PH
    AS:SYS THRST                        :rem 77
114 SYS THRST:SYS BAM:SYS THRST:IF(PEEK(4
    9402)AND15)>8THENPOKE53280,2:HIT=HIT+
    1                                   :rem 158
116 SYS THRST:SYS MOVE:POKE54273,0:SYS PH
    AS:IF PEEK(197)=60 THEN HIT=HIT+1
                                        :rem 224
117 SYSTHRST:POKE54277,15:POKE54276,17:SY
    S THRST:SYSTHRST:POKE54278,129:rem 13
118 SYS890:POKE54296,4:PRINT"{HOME}
    {2 DOWN}{GRN}"SPC(31)"SCORE{HOME}":PR
    INT"{DOWN}"SPC(25),(TI-T1)-HIT
                                        :rem 113
119 SYS THRST:POKE53280,0:SYS PHAS:IF PEE
    K(V)<20 THEN POKEV+1,(PEEK(V+7))
                                        :rem 73
120 SYS THRST:SYS PHAS:POKE54273,20:IF PE
    EK(V+2)<20 THEN POKEV+3,(PEEK(V+7))
                                        :rem 213
121 SYS THRST:SYS PHAS:IF PEEK(V+4)<20 TH
    EN POKEV+5,(PEEK(V+7))              :rem 222
123 SYS THRST:SYS BAM:SYS PHAS:SYS THRST
                                        :rem 102
124 SYS890:SYS PHAS:POKE54276,16:POKE5427
    6,17:SYS THRST                      :rem 115
125 SYS THRST:ON FQ GOTO 130,129,128,127,
    126                                 :rem 129
```

```
126 SYS THRST:SYS MOVE:SYS MOVE:SYS MOVE:
    SYS MOVE:SYS MOVE:SYS PHAS    :rem 194
127 SYS THRST:SYS MOVE:SYS MOVE:SYS MOVE:
    SYS PHAS                      :rem 227
128 SYS THRST:SYS MOVE:SYS MOVE:SYS MOVE:
    SYS PHAS                      :rem 228
129 SYS THRST:SYS MOVE:SYS MOVE:SYS PHAS
                                  :rem 117
130 SYS THRST:SYS MOVE:SYS MOVE:SYS PHAS
                                  :rem 109
131 SYS THRST:SYS MOVE:SYS THRUST:SYS MOV
    E:IF RND(.)<QI THEN8000       :rem 37
132 SYS THRST:A5=PEEK(197):POKEV+7,PEEK(V
    +7)+1:IFPEEK(V+7)>185THENPOKEV+7,185
                                  :rem 184
133 SYS890:IFA5=22ANDABS(PEEK(V+6)-PEEK(V
    +10))<25ANDPEEK(V+7)>175THENGOSUB6000
                                  :rem 183
135 XY$=STR$(100-(HIT*15.1))+"{2 SPACES}"
                                  :rem 107
140 SYS890:PRINTXX$;"ENERGY TO SHIELDS ";
    XY$                           :rem 216
145 SYS THRST:SYS PHAS:SYS THRST:IF HIT*1
    5.1>100THEN200                :rem 142
180 SYS THRST:EX=EX+1:IF EX>150THEN EX=40
    :LC=LC+1:IF LC>1 THEN 4000    :rem 140
190 SYS THRST:SYS MOVE:SYS PHAS:POKE V+6,
    EX:SYS THRST                  :rem 186
195 SYS THRST:SYS PHAS:GOTO110    :rem 157
200 PRINTXX$;"SHIELDS COLLAPSED,
    {2 SPACES}STARSHIP DESTROYED{HOME}"
                                  :rem 117
205 S=54272:POKES+24,15:POKES+5,192:POKES
    +6,129:U1=255:POKES+2,75:POKE53280,2
                                  :rem 230
210 N=190-PEEK(V+7):FOR CRASH=1 TO NSTEP4
                                  :rem 116
215 POKES+1,U1:POKES+4,17:U1=U1-1:rem 184
220 FOR DL=1TO10:NEXT:C1=(PEEK(V+7)+4):C2
    =(PEEK(V+6)+4)                :rem 136
225 IF C2>225 THENCRASH=N         :rem 159
230 POKEV+7,C1:POKEV+6,C2:NEXT     :rem 86
231 GOSUB 300                     :rem 169
234 POKEV+21,PEEK(V+21)AND(255-8) :rem 87
235 POKES+24,15:POKES+1,15:POKES+4,128
                                  :rem 203
240 POKES+5,9:POKES+1,20:POKES+4,128
                                  :rem 101
250 FORDL=1TO700:NEXT              :rem 47
260 POKES+4,129:GOTO3000          :rem 119
300 POKE 53277,PEEK(53277)AND(255-2↑3)
                                  :rem 36
301 POKE 53271,PEEK(53271)AND(255-2↑3)
                                  :rem 25
305 POKE 2043,216:POKEV+42,7:FOR DELAY=1T
    O20:NEXT:POKES+4,129          :rem 103
310 POKEV+7,PEEK(V+7)-10:POKE 53271,PEEK(
    53271)OR(2↑3):FOR DELAY=1TO10:NEXT
                                  :rem 162
312 POKES+24,7:FORD=1TO20:NEXT:POKES+24,8
    :FORD=1TO40:NEXT:POKES+24,13  :rem 62
315 POKE 53277,PEEK(53277)OR(2↑3):FOR DEL
    AY=1TO60:NEXT                 :rem 175
316 POKES+24,7:FORD=1TO40:NEXT:POKES+24,8
    :FORD=1TO20:NEXT:POKES+24,13  :rem 66
320 POKE 53271,PEEK(53271)AND(255-2↑3)
                                  :rem 26
325 POKEV+42,1:FORD=13TO1STEP-.5:POKES+24
    ,D:NEXT:POKES+4,128:POKES+24,9:RETURN
                                  :rem 151
499 REM SPRITE SUBSECTION          :rem 96
500 FOR N=13440TO13502:READA:POKEN,A:NEXT
                                  :rem 213
510 FOR N=13504TO13566:READA:POKEN,A:NEXT
                                  :rem 225
515 FOR N=13568TO13630:READA:POKEN,A:NEXT
                                  :rem 232
520 FOR N=13632TO13694:READA:POKEN,A:NEXT
                                  :rem 230
525 FOR N=13760TO13822:READA:POKEN,A:NEXT
                                  :rem 230
527 FOR N=13696TO13759:READA:POKEN,A:NEXT
                                  :rem 249
528 FOR N=13824TO13886:READA:POKEN,A:NEXT
                                  :rem 244
530 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,48,0,0,48,0,0,48,0,0    :rem 74
535 DATA 48,0,0,48,0,0,48,0,0,48,0,0,48,0
    ,0,0,0,0,0,0,0,0,0,0,0,0,0    :rem 107
540 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,96,0,1,248,255,223,255
                                  :rem 224
545 DATA 127,223,255,15,135,192,7,143,128
    ,3,159,0,15,255,0,15,255,0,7,255,128
                                  :rem 206
550 DATA 7,255,0,3,255,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                  :rem 70
555 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,224,0,1,248,0,3,252,0,3
                                  :rem 247
560 DATA 254,224,7,255,16,15,255,8,31,255
    ,132,127,255,254,255,255,255,255,255
                                  :rem 231
565 DATA 255,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,7,0,0,15,128,0,31,192,0,31,192,2
                                  :rem 80
570 DATA 63,240,7,127,248,15,191,248,15,2
    23,248,31,231,252,31,251,252,63,248
                                  :rem 165
575 DATA 254,63,255,6,127,255,248,255,255
    ,254,255,255,255,255,255,255,0,0,0,0,
    0                             :rem 64
580 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,24
    8,3,255,240,15,255,248,63,255,248,0,1
    5                             :rem 222
585 DATA 192,1,255,240,1,255,224,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                  :rem 16
590 DATA 0,0                      :rem 68
592 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,255,0,0
                                  :rem 30
593 DATA 255,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                                  :rem 215
595 DATA 0,0,0,0,112,0,3,252,0,15,255,128
    ,23,255,64,59,254,240,61,253,248,118
                                  :rem 185
596 DATA 171,252,251,255,60,255,254,220,1
    23,253,232,119,251,248,47,255,240,15
                                  :rem 220
597 DATA 223,224,7,223,224,3,223,192,3,21
    9,192,3,219,192,7,219,224,15,219,240
                                  :rem 215
598 DATA 0,0,0                    :rem 168
600 KI=49152:FOR N=KI TO 49204:READA:POKE
    N,A:NEXT                      :rem 134
610 DATA 162,210,173,30,208,141,62,192,41
    ,68,201,68,208,7,142,208,2,142,5,208
                                  :rem 193
620 DATA 96,173,62,192,41,66,201,66,208,7
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    ,142,198,2,142,3,208,96,173,62,192,41
                                        :rem 19
630 DATA 65,201,65,208,246,142,188,2,142,
    1,208,96                            :rem 113
640 BAM=49407:FOR N=BAM TO 49459:READA:PO
    KEN,A:NEXT                          :rem 17
641 DATA 162,210,173,30,208,141,62,192,41
    ,12,201,12,208,7,142,208,2,142,5,208
                                        :rem 175
642 DATA 96,173,62,192,41,10,201,10,208,7
    ,142,198,2,142,3,208,96,173,62,192,41
                                        :rem 1
643 DATA 9,201,9,208,246,142,188,2,142,1,
    208,96                              :rem 17
650 MOVE=49232:FORN=MOVETO49275:READA:POK
    EN,A:NEXT                           :rem 216
660 DATA 173,7,208,205,1,208,176,6,206,1,
    208                                 :rem 115
665 DATA 76,97,192,238,1,208,205,3,208,17
    6                                   :rem 42
670 DATA 6,206,3,208,76,111,192,238,3,208
    ,205,5,208,176,4,206,5,208,96,238
                                        :rem 71
680 DATA 5,208,96                       :rem 78
690 PHAS=49472:FOR N=PHAS TO 49531:READA:
    POKE N,A:NEXT                       :rem 199
691 DATA 165,197,201,60,240,1,96,169,129,
    141,4,212,173,7,208,174,6,208,142,12
                                        :rem 215
693 DATA 208,141,13,208,160,127,140,21,20
    8,238,12,208,173,12,208,208,13,169
                                        :rem 105
695 DATA 128,141,4,212,169,63,141,21,208,
    76,0,192,160,70,136,192,0,208,251
                                        :rem 59
697 DATA 76,93,193                      :rem 142
700 RETURN                              :rem 119
799 REM MAIN LOOP MACHINE LANGUAGE:rem 37
800 FOR N=828 TO 886:READA:POKEN,A:NEXT
                                        :rem 41
810 DATA 174,188,2,202,202,142,188,2,142,
    0,208,174,198,2,202,202,202,142,198
                                        :rem 146
815 DATA 2,142,2,208,174,208,2,202,142,20
    8,2,142,4,208,174,188,2,174,213,2,202
                                        :rem 232
820 DATA 142,213,2,142,8,208,174,211,2,20
    2,142,211,2,142,10,208,76,49,234
                                        :rem 236
850 RETURN                              :rem 125
879 REM RESET HARDWARE INTERUPT VECTOR
                                        :rem 171
880 FOR N=989TO1002:READA:POKEN,A:NEXT
                                        :rem 86
885 DATA 120,169,60,141,20,3,169,3,141,21
    ,3,88,96,32                         :rem 2
890 REM THRUSTERS (THRST)               :rem 63
891 THRST=890:FORN=890TO951:READA:POKEN,A
    :NEXT                               :rem 216
892 DATA 165,197,201,2,240,13,165,197,201
    ,7,240,19,165,197,197,60,240,25,96
                                        :rem 136
893 DATA 174,7,208,202,224,95,240,247,142
    ,7,208,96,174,7,208,232,224,190,240
                                        :rem 179
894 DATA 247,142,7,208,96,173,7,208,74,74
    ,74,24,105,25,168,174,6,208,24,32
                                        :rem 93
895 DATA 240,255,96,32                  :rem 74
899 RETURN                              :rem 138
900 POKE53280,0:POKE53281,0             :rem 238
910 GOSUB 1100                          :rem 220
920 PRINT"{CLR}":GOSUB 980              :rem 90
930 PRINT"{20 DOWN}{2}{35 I}{HOME}";
                                        :rem 202
950 PRINT"{WHT}{7 SPACES}{4 +} {4 +}
    {SHIFT-SPACE}{4 +}{SHIFT-SPACE}{+}
    {2 SHIFT-SPACE}{+}{5 SPACES}HI SCORE
    {SPACE}";                           :rem 80
952 PRINT" LEVEL{3 SPACES}{+}{2 SPACES}
    {+}{2 SPACES}{+} {+}{4 SPACES}{+}
    {2 +}{4 SPACES}"BSC                 :rem 75
954 PRINT"{2 SPACES}"FQ"{4 SPACES}{+}
    {2 SPACES}{4 +} {3 +}{2 SPACES}{3 +}
    {15 SPACES}";                       :rem 171
956 PRINT"{9 SPACES}{+}{2 SPACES}{+} {+}
    {2 SPACES}{+}{4 SPACES}{+} {+}
    {15 SPACES}";                       :rem 148
958 PRINT"{9 SPACES}{+}{2 SPACES}{+}
    {2 +} {4 +} {+} {2 +}{14 SPACES}";
                                        :rem 212
960 PRINT"{40 O}";                      :rem 147
965 FOR SV=1TO12:PRINTSPC(30)"{WHT}{RVS}
    {J}":NEXT                           :rem 146
970 PRINTSPC(31)"{9 U}{HOME}"           :rem 151
971 PRINT"{4 DOWN}"SPC(31)"{CYN}CONTROLS
    {DOWN}"                             :rem 185
972 PRINTSPC(31)"{YEL}CRSR-DN="         :rem 226
973 PRINTSPC(33)"DOWN{DOWN}"            :rem 90
974 PRINTSPC(31)"CRSR-RT="              :rem 90
975 PRINTSPC(34)"UP{DOWN}"              :rem 202
977 PRINTSPC(31)"{RVS}T{OFF}=BEAM-UP"
                                        :rem 47
978 PRINTSPC(31)"SPACEBAR=";           :rem 205
979 PRINTSPC(32)" FIRE":GOSUB9000:GOTO100
    0                                   :rem 243
980 FOR SF=1TO 20:K=(RND(X)*25+RND(Y)*400
    ):POKE 1250+K,46:NEXT               :rem 242
990 FOR CF=55296TO55555:POKECF,4:NEXT
                                        :rem 209
992 FOR CF=55556TO55855:POKECF,1:NEXT
                                        :rem 210
994 FOR CF=55856TO56295:POKECF,7:NEXT
                                        :rem 220
998 RETURN                              :rem 138
1000 RETURN                             :rem 161
1099 REM TITLE                          :rem 57
1100 FORN=1TO30:PRINT"{DOWN}";:NEXT
                                        :rem 59
1110 PRINT"{CLR}":M=1:GOSUB980          :rem 119
1200 POKE53277,PEEK(53277)OR(2↑3):FOR X=2
     50TO3 STEP-3                       :rem 24
1210 M=M+3:POKE V+6,M : POKEV+7,X       :rem 55
1220 NEXT                               :rem 4
1230 PRINT"{HOME}{7 DOWN}{WHT}";        :rem 97
1240 PRINT"{10 SPACES}{3 +} {3 +} {3 +}
     {+} {2 +}"                         :rem 96
1250 PRINT"{11 SPACES}{+}{2 SPACES}{+}
     {+} {+}{3 SPACES}{+} {+}"          :rem 125
1260 PRINT"{11 SPACES}{+}{2 SPACES}{3 +}
     {SPACE}{3 +} {3 +}"                :rem 22
1270 PRINT"{11 SPACES}{+}{2 SHIFT-SPACE}
     {+}{SHIFT-SPACE}{-}{SHIFT-SPACE}{+}
     {3 SHIFT-SPACE}{+}{SHIFT-SPACE}{+}"
                                        :rem 181
1280 PRINT"{11 SPACES}{+}{2 SPACES}{+}
     {SHIFT-SPACE}{+}{SHIFT-SPACE}{3 +}
     {SHIFT-SPACE}{+}{SHIFT-SPACE}{2 +}"
                                        :rem 242
1285 M=1                                :rem 139
1290 FOR X=3TO250STEP3:M=M+3            :rem 147
1300 POKEV+6,M:POKEV+7,X                :rem 200
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1310 NEXT                                :rem 4
1320 PRINT"{2 DOWN}";                    :rem 244
1371 PRINT"{DOWN}{8 SPACES}MISSION TO DEL
     TA MINOR"                           :rem 98
1375 FOR DELAY=1TO2000:NEXT              :rem 114
1379 GOSUB7000:RETURN                    :rem 53
1380 S=54272:FORL=STOS+24:POKEL,0:NEXT:PO
     KES+5,9:POKES+6,0:POKES+24,15:rem 71
1391 POKES+1,28:POKES,49:POKES+4,17
                                         :rem 70
1392 FORN=1TO125:NEXTN                   :rem 116
1393 POKES+4,16                          :rem 68
1394 FORN=1TO70:NEXTN                    :rem 69
1395 POKES+1,28:POKES,49:POKES+4,17
                                         :rem 74
1396 FORN=1TO125:NEXTN                   :rem 120
1397 POKES+4,16:FORL=STOS+24:POKEL,0:NEXT
     :RETURN                             :rem 112
3000 POKE2041,215:POKEV+21,0             :rem 38
3100 PRINT"{HOME}{11 DOWN}{OFF}{BLK}
     {10 SPACES}{YEL}G{RED}A{WHT}M{PUR}E
     {SPACE}{GRN}O{RED}V{CYN}E{BLU}R";
                                         :rem 105
3105 POKE54296,0:LC=0:POKE198,0          :rem 251
3110 PRINTXX$"{WHT}TYPE (E) TO END, TYPE
     {SPACE}(P) TO PLAY AGAIN"           :rem 9
3200 GETA$:IF A$="E"THEN POKE198,0:SYS198
                                         :rem 53
3205 IFA$<>"P"THEN3200                   :rem 192
3210 RESTORE:POKE2043,211:POKEV+21,63:T1=
     TI                                  :rem 87
3211 PRINT"{HOME}{11 DOWN}{27 SPACES}"
                                         :rem 102
3212 PRINTXX$"{39 SPACES}"               :rem 109
3213 PRINTXX$;:PRINT" SKILL LEVEL 1-4"
                                         :rem 249
3215 GETFQ$:IF FQ$<"1"OR FQ$>"4" THEN 321
     5                                   :rem 167
3216 FQ=VAL(FQ$)                         :rem 143
3217 PRINTXX$"{39 SPACES}"               :rem 114
3218 PRINT"{HOME}{2 DOWN}{GRN}"SPC(31)"SC
     ORE{HOME}":PRINT"{DOWN}"SPC(25),"
     {7 SPACES}"                         :rem 138
3220 PRINT"{HOME}{11 DOWN}{10 RIGHT}
     {5 SPACES}.{GRN}.{3 SPACES}.
     {3 SPACES}";:T1=TI:GOSUB920:GOTO95
                                         :rem 104
4000 B2=(TI-T1)-HIT:IFB2>BSCTHENBSC=B2
                                         :rem 50
4001 PRINT"{CLR}{YEL}";:POKEV+21,8:POKE53
     280,0:FORL=STOS+24:POKEL,0:NEXT:M=1:
     N=2                                 :rem 116
4004 POKE54272,40:POKE54296,15           :rem 144
4005 POKE54273,30+N:POKES+4,17:PRINT TAB(
     N)"M{4 SPACES}N B O[Y] [Y]O[Y] OP
     {SHIFT-SPACE}OP M{2 SPACES}N"
                                         :rem 206
4006 PRINT TAB(N)" M{SHIFT-SPACE} N
     {2 SHIFT-SPACE}B{SHIFT-SPACE}[H]
     {3 SPACES}[H]{2 SPACES}[H][N] L@
     {2 SPACES}MN{3 SPACES}"             :rem 213
4007 PRINT TAB(N)"{2 SPACES}MN{3 SPACES}B
      L[P]{2 SPACES}[H]{2 SPACES}L@
     {SHIFT-SPACE}[H]M{3 SPACES}[H]
     {3 SPACES}{HOME}";                  :rem 71
4008 N=N+M:IF N>7 OR N<1 THEN M=M*(-1):N1
     =N1+1:IFN1>4THEN 4010               :rem 99
4009 FORD=1TO10:NEXT:POKES+4,16:GOTO 4005
                                         :rem 205
4010 POKES+4,16:PRINT"{5 DOWN}{YEL}
     {11 SPACES}PEGASUS REFUELED!!"
                                         :rem 221
4020 PRINT"{11 SPACES}CONTINUING ON MISSI
     ON"                                 :rem 84
4030 PRINT"{11 SPACES}TO DELTA MINOR..."
                                         :rem 180
4035 M=1                                 :rem 135
4036 FOR X=3TO250STEP3:M=M+3             :rem 148
4037 POKEV+6,M:POKEV+7,X                 :rem 210
4038 NEXT                                :rem 14
4045 M=1                                 :rem 136
4046 FOR X=250TO3STEP-3:M=M+3            :rem 194
4047 POKEV+6,M:POKEV+7,X                 :rem 211
4048 NEXT                                :rem 15
4050 FORI=1TO1000:NEXTI:GOSUB 920:GOTO 30
     00                                  :rem 24
4999 REM RELOCATE CHARACTER SET          :rem 139
5000 POKE56334,0:POKE1,51                :rem 129
5020 FOR ADD=14336TO16384                :rem 94
5030 POKE ADD,PEEK(ADD+38912):NEXT ADD
                                         :rem 159
5040 POKE1,55:POKE56334,129:POKE53272,(PE
     EK(53272)AND240)OR14:RETURN         :rem 224
6000 POKEV+44,7:SYS THRST:HIT=HIT-2
                                         :rem 175
6010 SYS THRST:POKEV+44,9:RETURN         :rem 44
7000 FOR CD=1TO30:PRINT"{DOWN}";:NEXT
                                         :rem 121
7100 PRINT"[6]{5 SPACES}CAPTAINS LOG":PRI
     NT"{5 SPACES}STARDATE "TI$          :rem 139
7150 PRINT"{5 SPACES}[15 Y]"             :rem 87
7200 PRINT"{6 SPACES}THE PEGASUS IS EN RO
     UTE TO"                             :rem 244
7210 PRINT"{5 SPACES}DELTA MINOR. OUR MIS
     SION:"                              :rem 10
7220 PRINT"{5 SPACES}AID A FEDERATION RES
     EARCH"                              :rem 217
7230 PRINT"{5 SPACES}OUTPOST IN COMBATING
      A"                                 :rem 71
7250 PRINT"{5 SPACES}MUTANT VIRUS THAT IS
     "                                   :rem 222
7270 PRINT"{5 SPACES}THREATENING THE CONT
     INUED"                              :rem 100
7280 PRINT"{5 SPACES}EXISTENCE OF THE OUT
     POST.":PRINT                        :rem 243
7300 PRINT"{6 SPACES}WHILE EN ROUTE, THE
     {SPACE}SHIP"                        :rem 119
7310 PRINT"{5 SPACES}SUFFERED DAMAGE TO T
     HE"                                 :rem 19
7320 PRINT"{5 SPACES}MAIN POWER HOUSINGS.
      AS A"                              :rem 194
7330 PRINT"{5 SPACES}RESULT, WE ARE FORCE
     D TO"                               :rem 115
7340 PRINT"{5 SPACES}MINE NEW DILITHIUM C
     RYSTALS"                            :rem 208
7350 PRINT"{5 SPACES}ON A NEARBY PLANETOI
     D. THE"                             :rem 238
7360 PRINT"{5 SPACES}PLANETOID, HOWEVER,
     {SPACE}IS"                          :rem 85
7370 PRINT"{5 SPACES}GUARDED BY NUMEROUS
     {SPACE}LIFELESS"                    :rem 14
7380 PRINT"{5 SPACES}DRONES...":PRINT
                                         :rem 191
7390 PRINT"{WHT}{5 SPACES}HIT ANY KEY TO
     {SPACE}CONTINUE"                    :rem 103
7400 POKE198,0:GOSUB1380                 :rem 126
7500 GETA$:IFA$=""THEN7500               :rem 187
7501 T1=TI:RETURN                        :rem 70
8000 POKE53269,PEEK(53269)AND250         :rem 21
8005 A1=PEEK(53278):J1=0:POKEV+3,200:POKE
     2041,214:POKE710,1:POKE53288,7
                                         :rem 31
```

```
8010 FOR N=1TO60:SYS THRST:SYS MOVE:SYS M
     OVE:SYS THRST:SYS THRST:SYS THRST
                                    :rem 141
8015 POKE2041,210:POKES+4,129       :rem 102
8020 SYSTHRST:IF(PEEK(53278)AND10)=10THEN
     POKE53288,10:POKE2041,215:GOTO200
                                    :rem 183
8025 POKE2041,214                   :rem 136
8030 SYSMOVE:SYSTHRST:SYSMOVE:SYSTHRST:NE
     XT:POKE2041,215:POKE53288,10:rem 122
8035 POKES+4,128:POKE53269,63:GOTO132
                                    :rem 136
9000 PRINTXX$"{6 UP}":PRINTSPC(35)"{WHT}
     {5 U}";                         :rem 86
9010 POKE 646,9                     :rem 254
9020 PRINTSPC(35)"{RVS}{5 SPACES}";
                                    :rem 136
9030 PRINTSPC(35)"{RVS}{5 SPACES}";
                                    :rem 137
9035 PRINTSPC(35)"{RVS}{5 SPACES}";
                                    :rem 142
9040 RETURN                         :rem 173
```

VIC Music Tutor

Requires minimum of 8K memory expansion.

(Article on page 86.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
10 DI=INT(FRE(8)/16):DIMNN%(DI),NV(DI),N$
   (DI),V$(DI)                      :rem 196
20 PRINT"{CLR}{3 DOWN}"SPC(159)"MUSIC TUT
   OR"                              :rem 50
30 FORI=1TO 2000:NEXT               :rem 223
40 PRINT"{CLR}{DOWN}DO YOU WANT TO","
   {DOWN}1-PLAYBACK AN OLD TUNE2-RECORD A
    NEW ONE"                        :rem 65
50 INPUTA:ONAGOTO760,60:GOTO40      :rem 141
60 INPUT"{DOWN}SONG NUMBER";X:PRINT"
   {DOWN}NAME OF SONG":INPUTX$:C=1:rem 24
70 XX=1:PRINT"{CLR}YOU HAVE A MAXIMUM OF
   {SPACE}"DI"NOTES"                :rem 146
80 XX=XX+1:IFXX<=3THEN85            :rem 34
83 GOTO70                           :rem 11
85 PRINT"{DOWN}NOTE #"C:INPUTN$     :rem 39
90 IFN$="£"THENC=C-1:GOTO700       :rem 161
100 IFN$="R"THENN=0                 :rem 79
110 IFN$="C"THENN=135               :rem 170
120 IFN$="CS"ORN$="DF"THENN=143     :rem 27
130 IFN$="D"THENN=147               :rem 176
140 IFN$="DS"ORN$="EF"THENN=151     :rem 30
150 IFN$="E"THENN=159               :rem 182
160 IFN$="F"THENN=163               :rem 179
170 IFN$="FS"ORN$="GF"THENN=167     :rem 44
180 IFN$="G"THENN=175               :rem 185
190 IFN$="GS"ORN$="AF"THENN=179     :rem 44
200 IFN$="A"THENN=183               :rem 171
210 IFN$="AS"ORN$="BF"THENN=187     :rem 31
220 IFN$="B"THENN=191               :rem 173
230 IFN$="C1"THENN=195              :rem 228
240 IFN$="CS1"ORN$="DF1"THENN=199:rem 139
250 IFN$="D1"THENN=201              :rem 219
260 IFN$="DS1"ORN$="EF1"THENN=203:rem 129
270 IFN$="E1"THENN=207              :rem 228
280 IFN$="F1"THENN=209              :rem 232
290 IFN$="FS1"ORN$="GF1"THENN=212:rem 136
300 IFN$="G1"THENN=215              :rem 223
310 IFN$="GS1"ORN$="AF1"THENN=217:rem 129
320 IFN$="A1"THENN=219              :rem 223
330 IFN$="AS1"ORN$="BF1"THENN=221:rem 121
340 IFN$="B1"THENN=223              :rem 221
350 IFN$="C2"THENN=225              :rem 226
360 IFN$="CS2"ORN$="DF2"THENN=227:rem 136
370 IFN$="D2"THENN=228              :rem 232
380 IFN$="DS2"ORN$="EF2"THENN=229:rem 142
390 IFN$="E2"THENN=231              :rem 229
400 IFN$="F2"THENN=232              :rem 223
410 IFN$="FS2"ORN$="GF2"THENN=233:rem 135
420 IFN$="G2"THENN=235              :rem 229
430 IFN$="GS2"ORN$="AF2"THENN=236:rem 135
440 IFN$="A2"THENN=237              :rem 227
450 IFN$="AS2"ORN$="BF2"THENN=238:rem 134
460 IFN$="B2"THENN=239              :rem 232
470 IFN$="C3"THENN=240              :rem 227
480 PRINT"NOTE VALUE"               :rem 32
490 INPUTV$                         :rem 167
500 V$(C)=V$                        :rem 90
510 IFRIGHT$(V$,1)="D"THEND=1:V$=LEFT$(V$
   ,1)                              :rem 253
520 IFV$="W"THENV=16                :rem 161
530 IFV$="H"THENV=8                 :rem 100
540 IFV$="Q"THENV=4                 :rem 106
550 IFV$="S"THENV=1                 :rem 106
560 IFV$="E"THENV=2                  :rem 94
570 IFV$="T"THENV=.5                :rem 159
580 V$(C)=V$                         :rem 98
590 IFV$="W"ORV$="H"ORV$="Q"ORV$="E"ORV$=
   "S"ORV$="T"THEN610               :rem 214
600 V=VAL(V$)                       :rem 215
610 IFD=1THENV$=V$+"D":V=V*1.5:D=0
                                    :rem 183
620 PRINT"{RVS}NOTE #"C"{2 SPACES}{RVS}VA
   LUE":PRINTN$,V$:PRINT"{RVS}{PUR}
   {6 SPACES}CORRECT Y/N{5 SPACES}{BLU}"
                                    :rem 137
630 GETT$:IFT$<>"N"ANDT$<>"Y"THEN630
                                    :rem 104
640 IFT$="N"THENPRINT"{RVS}{5 SPACES}ENTE
   R AGAIN":GOTO70                  :rem 58
650 N$(C)=N$                        :rem 80
660 NN%(C)=N:NV(C)=V:IFSS=1THENRETURN
                                    :rem 109
670 C=C+1:IFC=DI-5THENPRINT"{RVS}FIVE MOR
   E NOTES BEFOREMEMORY IS FULL"    :rem 71
680 IFC=DITHENPRINT"{RVS}LAST NOTE":C=C-1
   :GOTO700                         :rem 27
690 GOTO80                          :rem 64
700 PRINT"{CLR}{DOWN}DO YOU WANT TO HEAR
   {SPACE}ITY/N"                    :rem 12
710 GETT$:IFT$=""THEN710            :rem 121
715 IF T$<>"Y"ANDT$<>"N"THEN 710    :rem 217
720 IFT$="Y"THEN850                  :rem 70
721 GOTO1130                        :rem 152
725 INPUT"DISK OR TAPE";Q$          :rem 24
726 IF LEFT$(Q$,1)<>"D"ANDLEFT$(Q$,1)<>"T
   "THEN762                         :rem 199
727 IF LEFT$(Q$,1)="D"THENQW=8:GOTO729
                                    :rem 199
728 QW=1                            :rem 183
729 INPUT "FILENAME";X$:IF X$=""THEN729
                                     :rem 5
```

```
730 OPEN1,QW,1,X$:PRINT#1,X:PRINT#1,X$:PR
    INT#1,C                          :rem 194
740 FORI=1TOC:PRINT#1,NN%(I):PRINT#1,NV(I
    ):NEXT:CLOSE1                    :rem 160
745 IF QW=8 THEN OPEN15,8,15:INPUT#15,Z:C
    LOSE15                           :rem 248
746 IF Z<>0 THEN PRINT"{CLR}DISK ERROR!!"
    :GOTO725                         :rem 207
750 PRINT"{DOWN}SONG SAVED":STOP     :rem 168
760 INPUT"{CLR}NAME OF SONG";X$      :rem 168
762 INPUT "DISK OR TAPE";Q$          :rem 25
763 IF LEFT$(Q$,1)<>"D"ANDLEFT$(Q$,1)<>"T
    "THEN762                         :rem 200
764 IF LEFT$(Q$,1)="D"THENQW=8:GOTO770
                                     :rem 196
765 QW=1                             :rem 184
770 OPEN1,QW,0,X$                    :rem 217
780 INPUT#1,X,X$,C                   :rem 30
790 PRINT"{CLR}SONG #";X:PRINTX$     :rem 52
800 FORI=1TOC                        :rem 28
810 INPUT#1,NN%(I),NV(I)             :rem 110
820 NEXT:CLOSE1                      :rem 186
825 IF QW=8 THEN OPEN15,8,15:INPUT#15,Z:C
    LOSE15:IF Z<>0 THEN PRINT"{CLR}DISK E
    RROR!!":STOP                     :rem 206
830 GOSUB1380                        :rem 231
840 PRINT"{RVS}SONG LOADED"          :rem 95
844 FORIJ=1 TO1500:NEXT              :rem 106
845 GOTO700                          :rem 113
850 Q=1:Y=C                          :rem 111
860 PRINT"{CLR}{3 DOWN}CHOOSE TEMPO"
                                     :rem 123
870 PRINT"{DOWN}0 THRU 10":PRINT"0=FASTES
    T...10=SLOWEST"                  :rem 64
880 INPUTM                           :rem 125
890 DU=(M+3)*10                      :rem 254
900 PRINT"{DOWN}SELECT PITCH",,,"1=LOW",,
    "2=MEDIUM",,"3=HIGH":INPUTW      :rem 244
910 SP=36873+W:L=36878               :rem 218
920 PRINT"{CLR}WHEN YOU ARE READY TO HEAR
     THE SONG PRESS{3 SPACES}{RVS}RETURN"
                                     :rem 213
930 GETG$:IFG$<>CHR$(13)THEN930      :rem 22
940 POKEL,15                         :rem 170
950 FORI=QTOY                        :rem 88
960 POKESP,NN%(I):FORH=1TODU*NV(I):NEXT:P
    OKESP,0                          :rem 84
970 IFSS=1THENGOSUB1280              :rem 189
980 NEXT                             :rem 224
990 POKEL,0:POKESP,0                 :rem 225
1000 PRINT"{CLR}{3 DOWN}{PUR}{RVS}END OF
     {SPACE}SONG{BLU}":PRINT"{2 DOWN}PRES
     S {RVS}{PUR}RETURN{OFF}{BLU} TO REPL
     AYEXACTLY"                      :rem 75
1010 PRINT"{DOWN}PRESS ANY OTHER KEY TOMA
     KE CHANGES"                     :rem 62
1020 GETR$:IFR$=""THEN1020           :rem 203
1030 IFR$=CHR$(13)THEN940            :rem 136
1035 SS=0                            :rem 220
1040 PRINT"{CLR}DO YOU WANT TO HEAR ITAGA
     IN?"                            :rem 242
1050 INPUT"Y/N";W$                   :rem 38
1060 IFW$="N"THEN1130                :rem 148
1070 PRINT"{CLR}{DOWN}1-JUST PART","2-THE
      WHOLE SONG":INPUTK             :rem 147
1080 ONKGOTO1090,850                 :rem 125
1090 PRINT"{DOWN}THERE ARE";C;"NOTES.":PR
     INT"ENTER THE START AND":PRINT"ENDIN
     G NOTES."                       :rem 242
1100 INPUT"START";Q                  :rem 176
1110 INPUT"ENDING NOTE";Y            :rem 22
1120 GOTO860                         :rem 155
1130 PRINT"{CLR}DO YOU WANT TO SINGLE STE
     P THROUGH THE TUNE?Y/N":GOSUB1360
                                     :rem 107
1140 IFC$="Y"THEN1180                :rem 143
1150 IFC$="N"THENPRINT"{CLR}DO YOU WANT T
     O ADD ANYNOTES Y/N":GOSUB1360:rem 32
1160 IFC$="Y"THENC=C+1:GOTO70        :rem 192
1170 IFC$="N"THENPRINT"{DOWN}DO YOU WANT
     {SPACE}TO SAVE{3 SPACES}THE TUNE
     {2 SPACES}Y/N?":GOTO1250        :rem 168
1180 PRINT"{CLR}PRESS F1 TO PLAY NOTE":PR
     INT"{DOWN}IF YOU WANT TO CHANGE THAT
      NOTE PRESS F7."                :rem 11
1190 PRINT"THEN ENTER REPLACEMENTNOTE AND
      VALUE":SS=1                    :rem 77
1200 PRINT"{DOWN}PRESS F2 TO ADD A NEW NO
     TE IN"                          :rem 14
1210 PRINT"{DOWN}PRESS F5 TO STOP THE
     {2 SPACES}SINGLE NOTE MODE"     :rem 149
1220 PRINT"{RVS}{DOWN} HIT ANY KEY TO CON
     T. "                            :rem 116
1230 GETI$:IFI$=""THEN1230           :rem 191
1240 GOTO 1070                       :rem 200
1250 GOSUB1360                       :rem 18
1260 IFC$="Y"THEN725                 :rem 102
1270 END                             :rem 161
1280 PRINT"NOTE #"I                  :rem 62
1290 PRINT"{RVS}{RED}{2 SPACES}NOTE
     {2 SPACES}{OFF}","{RVS} VALUE {OFF}
     {BLU}"                          :rem 67
1300 PRINTN$(I),V$(I)                :rem 157

1310 GETU$:IFU$<>CHR$(133)ANDU$<>CHR$(135
     )ANDU$<>CHR$(136)ANDU$<>CHR$(137)THE
     N1310                           :rem 205
1320 IFU$=CHR$(133)THENRETURN        :rem 3
1330 IFU$=CHR$(137)THENGOTO1900      :rem 43
1340 IFU$=CHR$(135)THEN1000          :rem 232
1350 CT=C:C=I:PRINT"{RVS}ENTER REPLACEMEN
     T":GOSUB80:C=CT:RETURN          :rem 59
1360 INPUTC$:IFC$<>"Y"ANDC$<>"N"THEN1360
                                     :rem 71
1370 RETURN                          :rem 171
1380 FORI=1TOC                       :rem 80
1390 IFNN%(I)=135THENN$(I)="C":GOTO1760
                                     :rem 205
1400 IFNN%(I)=143THENN$(I)="CS(DF)":GOTO1
     760                             :rem 242
1410 IFNN%(I)=147THENN$(I)="D":GOTO1760
                                     :rem 202
1420 IFNN%(I)=151THENN$(I)="EF(DS)":GOTO1
     760                             :rem 245
1430 IFNN%(I)=159THENN$(I)="E":GOTO1760
                                     :rem 208
1440 IFNN%(I)=163THENN$(I)="F":GOTO1760
                                     :rem 205
1450 IFNN%(I)=167THENN$(I)="FS(GF)":GOTO1
     760                             :rem 3
1460 IFNN%(I)=175THENN$(I)="G":GOTO1760
                                     :rem 211
1470 IFNN%(I)=179THENN$(I)="AF(GS)":GOTO1
     760                             :rem 3
1480 IFNN%(I)=183THENN$(I)="A":GOTO1760
                                     :rem 206
1490 IFNN%(I)=187THENN$(I)="BF(AS)":GOTO1
     760                             :rem 255
1500 IFNN%(I)=191THENN$(I)="B":GOTO1760
                                     :rem 199
1510 IFNN%(I)=195THENN$(I)="C1":GOTO1760
                                     :rem 254
```

```
1520 IFNN%(I)=199THENN$(I)="CS1(DF1)":GOT
     O1760                              :rem 98
1530 IFNN%(I)=201THENN$(I)="D1":GOTO1760
                                        :rem 245
1540 IFNN%(I)=203THENN$(I)="EF1(DS1)":GOT
     O1760                              :rem 88
1550 IFNN%(I)=207THENN$(I)="E1":GOTO1760
                                        :rem 254
1560 IFNN%(I)=209THENN$(I)="F1":GOTO1760
                                        :rem 2
1570 IFNN%(I)=212THENN$(I)="FS1(GF1)":GOT
     O1760                              :rem 95
1580 IFNN%(I)=215THENN$(I)="G1":GOTO1760
                                        :rem 2
1590 IFNN%(I)=217THENN$(I)="AF1(GS1)":GOT
     O1760                              :rem 97
1600 IFNN%(I)=219THENN$(I)="A1":GOTO1760
                                        :rem 249
1610 IFNN%(I)=221THENN$(I)="BF1(AS1)":GOT
     O1760                              :rem 80
1620 IFNN%(I)=223THENN$(I)="B1":GOTO1760
                                        :rem 247
1630 IFNN%(I)=225THENN$(I)="C2":GOTO1760
                                        :rem 252
1640 IFNN%(I)=227THENN$(I)="CS2(DF2)":GOT
     O1760                              :rem 95
1650 IFNN%(I)=228THENN$(I)="D2":GOTO1760
                                        :rem 2
1660 IFNN%(I)=229THENN$(I)="EF2(DS2)":GOT
     O1760                              :rem 101
1670 IFNN%(I)=231THENN$(I)="E2":GOTO1760
                                        :rem 255
1680 IFNN%(I)=232THENN$(I)="F2":GOTO1760
                                        :rem 2
1690 IFNN%(I)=233THENN$(I)="FS2(GF2)":GOT
     O1760                              :rem 103
1700 IFNN%(I)=235THENN$(I)="G2":GOTO1760
                                        :rem 255
1710 IFNN%(I)=236THENN$(I)="AF2(GS2)":GOT
     O1760                              :rem 94
1720 IFNN%(I)=237THENN$(I)="A2":GOTO1760
                                        :rem 253
1730 IFNN%(I)=238THENN$(I)="BF2(AS2)":GOT
     O1760                              :rem 93
1740 IFNN%(I)=239THENN$(I)="B2":GOTO1760
                                        :rem 2
1750 IFNN%(I)=240THENN$(I)="C3"   :rem 188
1760 IFNV(I)=16THENV$(I)="W":GOTO1890
                                        :rem 159
1770 IFNV(I)=8THENV$(I)="H":GOTO1890
                                        :rem 98
1780 IFNV(I)=4THENV$(I)="Q":GOTO1890
                                        :rem 104
1790 IFNV(I)=2THENV$(I)="E":GOTO1890
                                        :rem 91
1800 IFNV(I)=1THENV$(I)="S":GOTO1890
                                        :rem 96
1810 IFNV(I)=.5THENV$(I)="T":GOTO1890
                                        :rem 148
1820 IFNV(I)=24THENV$(I)="WD":GOTO1890
                                        :rem 223
1830 IFNV(I)=12THENV$(I)="HD":GOTO1890
                                        :rem 206
1840 IFNV(I)=6THENV$(I)="QD":GOTO1890
                                        :rem 171
1850 IFNV(I)=3THENV$(I)="ED":GOTO1890
                                        :rem 157
1860 IFNV(I)=1.5THENV$(I)="SD":GOTO1890
                                        :rem 13
1870 IFNV(I)=.75THENV$(I)="TD":GOTO1890
                                        :rem 21
1880 V$(I)=STR$(NV(I))             :rem 206
1890 NEXT:RETURN                    :rem 43
1900 C=C+1:FORJ=CTOI+1STEP-1:NN%(J)=NN%(J
     -1):NV(J)=NV(J-1)             :rem 150
1910 N$(J)=N$(J-1):V$(J)=V$(J-1):NEXT:CT=
     C:C=I:PRINT"{RVS}ENTER ADDITIONAL NO
     TE"                           :rem 246
1920 GOSUB80:C=CT:RETURN            :rem 31
```

Vocab Builder

(Article on page 84.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
5 SYS65517:IFPEEK(781)=40THENPRINT"{WHT}"
  :GOTO10                           :rem 149
6 PRINT"{BLK}"                      :rem 151
10 PRINTCHR$(14):DIMA%(100),W$(100),D$(10
   0),WR$(100):D=0                  :rem 198
30 PRINT"{CLR}{7 DOWN}{RVS}ENTER YOUR NAM
   E{OFF}":INPUTNM$:IFLEN(NM$)=0THEN30
                                    :rem 144
35 IFLEN(NM$)>13THENNM$=LEFT$(NM$,13)
                                    :rem 162
50 PRINT"{CLR}{RVS}"TAB(INT((22-LEN(NM$))
   /2)-1)NM$;"'S{OFF}":PRINTTAB(3)"{RVS}V
   OCABULARY TEST{OFF}"             :rem 91
55 N$="":A$="":B$="":DA$="":X%=0:I=0:J=0:
   FORQ=1TO100:A%(Q)=0:W$(Q)="":D$(Q)=""
                                    :rem 103
60 WR$(Q)="":NEXT:PRINTSPC(9);"{2 DOWN}ME
   NU":PRINTSPC(2);"{2 DOWN}1) ENTER NEW
   {SPACE}WORDS"                    :rem 254
80 PRINTSPC(2);"{DOWN}2) STUDY YOUR WORDS
   ":PRINTSPC(2);"{DOWN}3) TAKE A TEST"
                                    :rem 130
100 PRINTSPC(2);"{DOWN}4) END":PRINT"
    {2 DOWN}{RVS} PRESS 1-4 TO CONTINUE
    {OFF}"                          :rem 195
120 GETZ$:C$=Z$:V=VAL(Z$):IFZ$=""OR(V<1OR
    V>4)THEN120                     :rem 116
130 IFV=4THEN190                    :rem 179
140 INPUT"{2 DOWN}{RVS}D{OFF}ISK OR {RVS}
    T{OFF}APE";Z$:IFZ$<>"T"ANDZ$<>"D"THEN
    PRINT"{4 UP}":GOTO130           :rem 121
150 A$="{LEFT}{22 SPACES}":IFZ$="D"THEND=
    1                                :rem 6
160 ONVGOTO230,810,810              :rem 226
190 END                             :rem 113
230 PRINT"{CLR}{6 DOWN}ENTER # OF NEW WOR
    DS "                            :rem 14
235 INPUTX%:IFX%>100ORX%<1THEN230   :rem 11
250 FORI=1TOX%                      :rem 85
260 PRINT"{CLR}{3 DOWN}ENTER WORD"I:INPUT
    W$(I)                           :rem 17
265 IFLEN(W$(I))=0THENPRINT"{6 UP}":GOTO2
    60                              :rem 79
270 PRINT"{DOWN}ENTER DEFINITION":INPUTD$
    (I)                             :rem 174
275 IFLEN(D$(I))=0THENPRINT"{3 UP}":GOTO2
    70                              :rem 139
```

```
280 NEXT                                :rem 217
300 PRINT"{CLR}":FORI=1TOX%             :rem 239
310 PRINT" WORD"I"{LEFT}:";W$(I)        :rem 213
320 PRINT"{DOWN} DEFINITION:"D$(I):PRINT"
    {DOWN}"                             :rem 56
330 IF(I/3)=INT(I/3)ANDX%=3THEN360
                                        :rem 205
332 IF(I/3)=INT(I/3)ANDX%<>ITHENGOSUB2000
                                        :rem 203
340 NEXT                                :rem 214
360 PRINT"{DOWN}{RVS}ANY CORRECTIONS(Y/N)
    ? {OFF}"                            :rem 184
380 GETZ$:IFZ$=""OR(Z$<>"Y"ANDZ$<>"N")THE
    N380                                :rem 111
390 IFZ$="Y"THEN420                      :rem 72
400 IFZ$="N"THEN520                      :rem 54
420 I=0:INPUT"{CLR}{4 DOWN}WHICH ENTRY";I
                                        :rem 58
435 IFI=0ORI>X%THENPRINT"{4 UP}":GOTO420
                                        :rem 211
440 PRINT"{2 DOWN}WORD"I"{LEFT}:";W$(I)
                                        :rem 251
450 PRINT"{DOWN}DEFINITION:";D$(I):rem 91
470 PRINT"{2 DOWN}ENTER WORD"I:INPUTW$
                                        :rem 214
480 W$(I)=W$                            :rem 105
490 PRINT"{DOWN}ENTER DEFINITION":INPUTD$
                                        :rem 24
500 D$(I)=D$                             :rem 60
510 GOTO300                              :rem 98
520 INPUT"{2 DOWN}TODAY'S DATE: ";DA$
                                        :rem 196
540 PRINT"{CLR}{8 DOWN}{5 SPACES}{RVS}PLE
    ASE WAIT"                           :rem 134
550 PRINT"{2 DOWN}{RVS}I'M SAVING YOUR WO
    RDS {OFF}{2 DOWN}"                  :rem 182
560 N$="TEST "+DA$                      :rem 162
565 IFD=1THENN$="TEST "+DA$+",S,W"
                                        :rem 136
570 OPEN15,8,15:OPEN1+D,1+7*D,1+D,N$:INPU
    T#15,A$,B$                          :rem 67
572 IFA$="63"THENCLOSE(1+D):CLOSE15:GOTO5
    20                                  :rem 50
575 IFA$<>"00"THENPRINTB$:FORI=1TO3000:NE
    XT:CLOSE(1+D):CLOSE15:GOTO50        :rem 27
580 PRINT#(1+D),X%:FORI=1TOX%           :rem 223
590 PRINT#(1+D),W$(I):PRINT#(1+D),D$(I)
                                        :rem 137
600 NEXTI:CLOSE(1+D):CLOSE15:GOTO50
                                        :rem 173
810 PRINT"{CLR}{DOWN} {RVS}A TEST MADE JU
    ST FOR{OFF}":PRINTTAB(INT((22-LEN(NM$
    ))/2)-1)"{RVS}"NM$"{OFF}"           :rem 157
820 PRINT"{2 DOWN}ENTER THE TEST DATE ":I
    NPUTDA$                             :rem 61
870 PRINT"{CLR}{5 DOWN}{5 SPACES}{RVS}PLE
    ASE WAIT"                           :rem 89
880 PRINT"{DOWN}{2 SPACES}{RVS}LOADING TH
    E WORDS{OFF}"                       :rem 148
890 N$="TEST "+DA$                      :rem 168
895 IFD=1THENN$="TEST "+DA$+",S,R"
                                        :rem 137
900 OPEN15,8,15:OPEN1+D,1+7*D,2*D,N$:INPU
    T#15,A$,B$                          :rem 64
902 IFA$="62"THENCLOSE1+D:CLOSE15:GOTO810
                                        :rem 223
905 IFA$<>"00"THENPRINTB$:FORI=1TO3000:NE
    XT:CLOSE(1+D):CLOSE15:GOTO50        :rem 24
910 INPUT#(1+D),X%:FORI=1TOX%           :rem 223
920 INPUT#(1+D),W$(I)                   :rem 128
930 IFW$(I)=""THENGOTO950               :rem 199
940 GOTO960                             :rem 117
950 I=X%:GOTO970                        :rem 180
960 INPUT#(1+D),D$(I)                   :rem 113
970 NEXTI                               :rem 40
980 CLOSE(1+D):CLOSE15                  :rem 30
1030 FORI=1TOX%                         :rem 130
1040 A%=X%*RND(1)+1:IFI=1THENA%(I)=A%:GOT
     O1070                              :rem 94
1050 FORJ=1TOX%                         :rem 133
1060 IFA%=A%(J)THENJ=X%:NEXT:GOTO1040
                                        :rem 222
1065 NEXT                               :rem 11
1070 A%(I)=A%:NEXT                      :rem 228
1110 IFC$="2"THENGOTO1510               :rem 155
1120 PRINT"{CLR}{DOWN}{RVS} ";NM$;"'S QUI
     Z {OFF}"                           :rem 153
1130 N%=0                               :rem 165
1140 FORI=1TOX%                         :rem 132
1150 PRINT"{2 DOWN}"                    :rem 186
1160 N=A%(I)                            :rem 83
1170 PRINT"DEFINITION: ";:PRINTD$(N)
                                        :rem 70
1180 WO$="":PRINT"{DOWN}ENTER THE WORD":I
     NPUTWO$:IFWO$=""THEN1180           :rem 109
1190 IFWO$=W$(N)THENPRINT"{DOWN}CORRECT !
     ":FORZ=1TO1500:NEXT:GOTO1230       :rem 67
1200 PRINT"{DOWN}SORRY, THE WORD WAS:":PR
     INTW$(N):FORZ=1TO1500:NEXT         :rem 222
1210 N%=N%+1                            :rem 67
1220 WR$(N)=W$(N)                       :rem 136
1230 PRINT"{CLR}":NEXTI                 :rem 236
1250 PRINT"{6 DOWN}YOU GOT"N%"WRONG":PRIN
     T"OUT OF"X%:GOSUB1900:IFN%=0THEN2100
                                        :rem 222
1260 FORI=1TO3000:NEXT                  :rem 70
1270 PRINT"{CLR}{2 DOWN}THE WORD(S) THAT
     {SPACE}YOU":PRINT"GOT WRONG ARE:"
                                        :rem 83
1280 J=1:PQ=0:FORI=1TOX%                :rem 195
1290 IFWR$(I)=""THEN1310                :rem 55
1300 PQ=PQ+1:PRINT"{DOWN}";WR$(I)       :rem 93
1305 IFPQ<>5*JTHEN1310                  :rem 16
1306 J=J+1:PRINT"{DOWN} {RVS}ANY KEY TO C
     ONTINUE{OFF}":POKE198,0            :rem 119
1307 GETZ$:IFZ$=""THEN1307              :rem 235
1308 PRINT"{CLR}":NEXTI:GOTO50          :rem 202
1310 NEXTI:GOSUB2000:GOTO50             :rem 161
1510 PRINT"{CLR}{RVS} HIT THE BOOKS "
                                        :rem 129
1520 N%=0                               :rem 168
1530 FORI=1TOX%                         :rem 135
1540 PRINT"{2 DOWN}":N=A%(I)            :rem 130
1550 J%=1:J1%=1                         :rem 240
1560 PRINT"DEFINITION: ";:PRINTD$(N)
                                        :rem 73
1570 WO$="":PRINT"{DOWN}ENTER THE WORD":I
     NPUTWO$                            :rem 99
1580 IFWO$=W$(N)THENPRINT"{DOWN}CORRECT !
     ":GOTO1790                         :rem 134
1590 IFLEFT$(WO$,2)=LEFT$(W$(N),2)THENGOT
     O1610                              :rem 171
1600 GOTO1680                           :rem 207
1610 IFJ1%>1THENGOTO1750                :rem 155
1620 PRINT"{DOWN}YOU'RE CLOSE":PRINT"TRY
     {SPACE}AGAIN"                      :rem 70
1630 J1%=J1%+1                          :rem 163
1640 IFW$(N)=WR$(N)THENGOTO1670          :rem 83
1650 WR$(N)=W$(N)                       :rem 143
1670 PRINT"{2 DOWN}":GOTO1560            :rem 0
1680 IFJ%>2THENGOTO1750                 :rem 114
1690 PRINT {DOWN}SORRY, ";NM$:PRINT"YOU'R
```

```
     E NOT EVEN CLOSE":PRINT"{DOWN}TRY AG
     AIN"                              :rem 77
1691 FORZ=1TO2500:NEXT:PRINT"{CLR}":rem 1
1700 PRINT"{2 DOWN}":J%=J%+1          :rem 108
1710 IFW$(N)=WR$(N)THENGOTO1740       :rem 79
1720 WR$(N)=W$(N)                     :rem 141
1740 GOTO1560                         :rem 209
1750 PRINT"{DOWN}SORRY, THE WORD WAS:":PR
     INT"{DOWN} "W$(N):FORZ=1TO3000:NEXT:
     PRINT"{CLR}"                     :rem 216
1760 IFW$(N)=WR$(N)THENGOTO1790       :rem 89
1770 WR$(N)=W$(N)                     :rem 146
1780 N%=N%+1                          :rem 79
1790 FORTD=1TO1500:NEXT:PRINT"{CLR}":NEXT
     I:GOTO1250                       :rem 59
1900 IFN%=0THENPRINT"{2 DOWN}{RVS}GREAT J
     OB":RETURN                       :rem 213
1910 N=10-(N%/X%*10)                  :rem 223
1920 IFN<6.5THENPRINT"{DOWN}BETTER STUDY
     {SPACE}MORE":RETURN              :rem 187
1930 IFN<8THENPRINT"{DOWN}A LITTLE MORE S
     TUDY":PRINT"NEEDED":RETURN       :rem 84
1940 IFN<9THENPRINT"{DOWN}NOT BAD":RETURN
                                      :rem 131
1950 IFN<9.5THENPRINT"{DOWN}GOOD JOB":RET
     URN                              :rem 51
1960 IFN<10THENPRINT"{DOWN}VERY GOOD"RETU
     RN                               :rem 42
1970 RETURN                           :rem 177
2000 PRINT"{DOWN}{RVS} ANY KEY TO CONTINU
     E{2 SPACES}"                     :rem 15
2001 GETMT$:IFMT$=""THEN2001          :rem 105
2002 PRINT"{CLR}":RETURN              :rem 66
2100 GOSUB2000:GOTO50                 :rem 221
```

Power BASIC

(Article on page 128.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:
Hi-Res Screen Dump— 64 Version

```
3 INPUT"{CLR}WIDTH 1 OR 2";WI$        :rem 29
4 IF VAL(WI$)<1OR VAL(WI$)>2 THEN3
                                      :rem 147
5 POKE2,VAL(WI$)                      :rem 186
10 I=52224                            :rem 230
20 READ A:IF A=256 THEN 40            :rem 54
25 PRINT"{CLR}ENTERING DATA":POKE646,A
                                      :rem 183
30 POKE I,A:I=I+1:CH=CH+A:GOTO 20:rem 123
40 IF CH<>60660 THENPRINT"ERROR IN DATA S
   TATEMENTS":END                     :rem 78
50 PRINT"SYS 52224 TO START DUMP":END
                                      :rem 172
52224 DATA 173,0,221,41,3,73          :rem 87
52230 DATA 3,160,6,10,136,208         :rem 135
52236 DATA 252,141,132,3,173,24       :rem 241
52242 DATA 208,41,8,240,9,24          :rem 97
52248 DATA 169,32,109,132,3,141       :rem 249
52254 DATA 132,3,169,0,32,189         :rem 152
52260 DATA 255,169,4,170,160,255      :rem 48
52266 DATA 32,186,255,32,192,255      :rem 56
52272 DATA 162,4,32,201,255,176       :rem 247
52278 DATA 3,76,61,204,76,32          :rem 109
52284 DATA 205,169,8,32,210,255       :rem 254
52290 DATA 169,13,32,210,255,162      :rem 41
52296 DATA 0,169,1,141,198,205        :rem 206
52302 DATA 169,0,141,199,205,169      :rem 50
52308 DATA 0,141,200,205,169,199      :rem 42
52314 DATA 141,201,205,32,225,255     :rem 79
52320 DATA 208,3,76,32,205,138        :rem 196
52326 DATA 72,152,72,32,41,205        :rem 195
52332 DATA 104,168,104,170,173,205
                                      :rem 136
52338 DATA 205,45,203,205,240,12      :rem 32
52344 DATA 173,202,205,13,198,205     :rem 91
52350 DATA 141,202,205,76,143,204     :rem 81
52356 DATA 173,198,205,73,255,45      :rem 62
52362 DATA 202,205,141,202,205,14     :rem 73
52368 DATA 198,205,173,198,205,201
                                      :rem 158
52374 DATA 128,240,20,24,173,199      :rem 50
52380 DATA 205,105,1,141,199,205      :rem 38
52386 DATA 173,200,205,105,0,141      :rem 30
52392 DATA 200,205,76,93,204,173      :rem 46
52398 DATA 202,205,9,128,224,45       :rem 1
52404 DATA 144,10,173,202,205,41      :rem 26
52410 DATA 31,9,128,141,202,205       :rem 235
52416 DATA 142,207,205,166,2,142      :rem 37
52422 DATA 206,205,168,32,210,255     :rem 87
52428 DATA 152,206,206,205,208,246
                                      :rem 144
52434 DATA 174,207,205,169,1,141      :rem 43
52440 DATA 198,205,169,0,141,202      :rem 40
52446 DATA 205,56,173,199,205,233     :rem 106
52452 DATA 6,141,199,205,173,200      :rem 43
52458 DATA 205,233,0,141,200,205      :rem 28
52464 DATA 206,201,205,173,201,205
                                      :rem 130
52470 DATA 201,255,240,3,76,93        :rem 201
52476 DATA 204,224,45,176,31,24       :rem 253
52482 DATA 173,199,205,105,7,141      :rem 51
52488 DATA 199,205,173,200,205,105
                                      :rem 149
52494 DATA 0,141,200,205,232,169      :rem 36
52500 DATA 199,141,201,205,169,13     :rem 89
52506 DATA 32,210,255,76,93,204       :rem 251
52512 DATA 169,13,32,210,255,32       :rem 242
52518 DATA 231,255,96,173,201,205     :rem 97
52524 DATA 41,7,141,204,205,173       :rem 242
52530 DATA 201,205,74,74,74,168       :rem 255
52536 DATA 185,146,205,133,251,185
                                      :rem 152
52542 DATA 172,205,133,252,24,165     :rem 91
52548 DATA 251,109,204,205,133,251
                                      :rem 140
52554 DATA 165,252,105,0,133,252      :rem 38
52560 DATA 24,173,132,3,101,252       :rem 237
52566 DATA 133,252,173,199,205,41     :rem 104
52572 DATA 7,73,7,168,200,169         :rem 164
52578 DATA 0,56,42,136,208,252        :rem 207
52584 DATA 141,203,205,24,173,200     :rem 83
52590 DATA 205,101,252,133,252,173
                                      :rem 136
52596 DATA 199,205,41,248,168,138     :rem 121
52602 DATA 72,120,162,52,134,1        :rem 186
52608 DATA 177,251,162,55,134,1       :rem 254
52614 DATA 88,168,104,170,152,45      :rem 53
```

```
52620 DATA 203,205,141,205,205,96 :rem 84
52626 DATA 0,64,128,192,0,64      :rem 102
52632 DATA 128,192,0,64,128,192    :rem 0
52638 DATA 0,64,128,192,0,64      :rem 105
52644 DATA 128,192,0,64,128,192    :rem 3
52650 DATA 0,64,0,1,2,3           :rem 88
52656 DATA 5,6,7,8,10,11          :rem 155
52662 DATA 12,13,15,16,17,18       :rem 96
52668 DATA 20,21,22,23,25,26       :rem 94
52674 DATA 27,28,30,31,256          :rem 9
```

Program 2:
Hi-Res Screen Dump— VIC Version

```
5 POKE56,14:CLR                   :rem 123
6 INPUT"{CLR}WIDTH 1 OR 2";WI$:IF VAL(WI$
  )<1OR VAL(WI$)>2THEN 6          :rem 188
7 POKE2,VAL(WI$)                  :rem 188
10 I=3584                         :rem 187
20 READ A:IF A=256 THEN 40         :rem 54
30 POKE I,A:I=I+1:CH=CH+A:GOTO 20:rem 123
40 IF CH<>35292THENPRINT"ERROR IN DATA":S
   TOP                            :rem 184
50 PRINT"ENTER SYS 3584 TO DUMP SCREEN":S
   TOP                            :rem 160
3584 DATA 169,16,141,132,3,169,0  :rem 44
3591 DATA 32,189,255,169,4,170,160
                                  :rem 154
3598 DATA 255,32,186,255,32,192,255
                                  :rem 212
3605 DATA 162,4,32,201,255,176,3  :rem 34
3612 DATA 76,34,14,76,5,15,169    :rem 207
3619 DATA 8,32,210,255,169,13,32  :rem 42
3626 DATA 210,255,162,0,169,1,141 :rem 82
3633 DATA 104,15,169,0,141,105,15 :rem 78
3640 DATA 169,0,141,106,15,169,159
                                  :rem 145
3647 DATA 141,107,15,32,225,255,208
                                  :rem 190
3654 DATA 3,76,5,15,138,72,152    :rem 204
3661 DATA 72,32,14,15,104,168,104 :rem 84
3668 DATA 170,173,111,15,45,109,15
                                  :rem 142
3675 DATA 240,12,173,108,15,13,104
                                  :rem 131
3682 DATA 15,141,108,15,76,116,14 :rem 90
3689 DATA 173,104,15,73,255,45,108
                                  :rem 154
3696 DATA 15,141,108,15,14,104,15 :rem 85
3703 DATA 173,104,15,201,128,240,20
                                  :rem 171
3710 DATA 24,173,105,15,105,1,141 :rem 71
3717 DATA 105,15,173,106,15,105,0 :rem 78
3724 DATA 141,106,15,76,66,14,173 :rem 94
3731 DATA 108,15,9,128,224,22,144 :rem 88
3738 DATA 10,173,108,15,41,63,9   :rem 249
3745 DATA 128,141,108,15,142,113,15
                                  :rem 183
3752 DATA 166,2,142,112,15,168,32 :rem 87
3759 DATA 210,255,152,206,112,15,208
                                  :rem 237
3766 DATA 246,174,113,15,169,1,141
                                  :rem 146
3773 DATA 104,15,169,0,141,108,15 :rem 86
3780 DATA 56,173,105,15,233,6,141 :rem 90
3787 DATA 105,15,173,106,15,233,0 :rem 87
3794 DATA 141,106,15,206,107,15,173
                                  :rem 189
3801 DATA 107,15,201,255,240,3,76 :rem 81
3808 DATA 66,14,224,22,176,31,24  :rem 42
3815 DATA 173,105,15,105,7,141,105
                                  :rem 131
3822 DATA 15,173,106,15,105,0,141 :rem 75
3829 DATA 106,15,232,169,159,141,107
                                  :rem 249
3836 DATA 15,169,13,32,210,255,76 :rem 97
3843 DATA 66,14,169,13,32,210,255 :rem 93
3850 DATA 32,231,255,96,173,105,15
                                  :rem 143
3857 DATA 74,74,74,168,185,62,15  :rem 69
3864 DATA 133,253,185,83,15,133,254
                                  :rem 201
3871 DATA 173,105,15,41,7,73,7    :rem 201
3878 DATA 168,200,169,0,56,42,136:rem 104
3885 DATA 208,252,141,109,15,172,107
                                  :rem 245
3892 DATA 15,177,253,45,109,15,141
                                  :rem 150
3899 DATA 111,15,96,0,160,64,224   :rem 48
3906 DATA 128,32,192,96,0,160,64   :rem 48
3913 DATA 224,128,32,192,96,0,160 :rem 92
3920 DATA 64,224,128,16,16,17,17   :rem 43
3927 DATA 18,19,19,20,21,21,22    :rem 192
3934 DATA 22,23,24,24,25,26,26    :rem 193
3941 DATA 27,27,28,256             :rem 72
```

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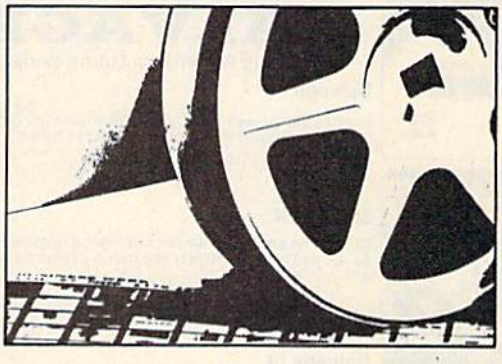

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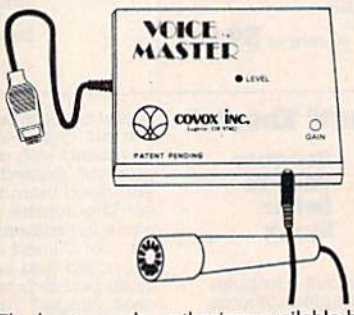

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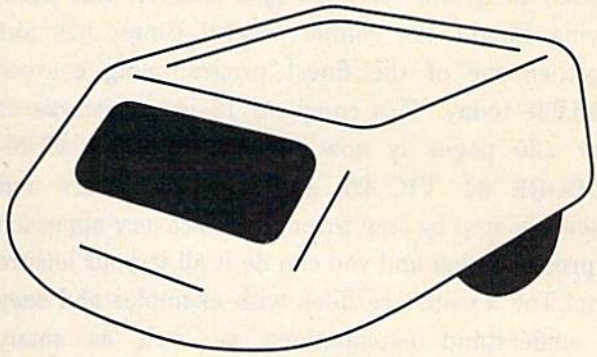

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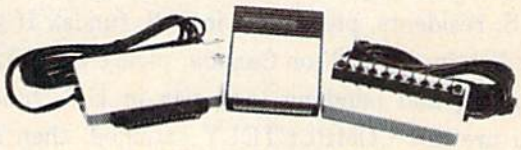

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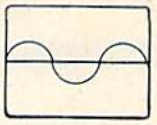

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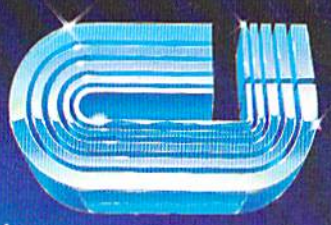

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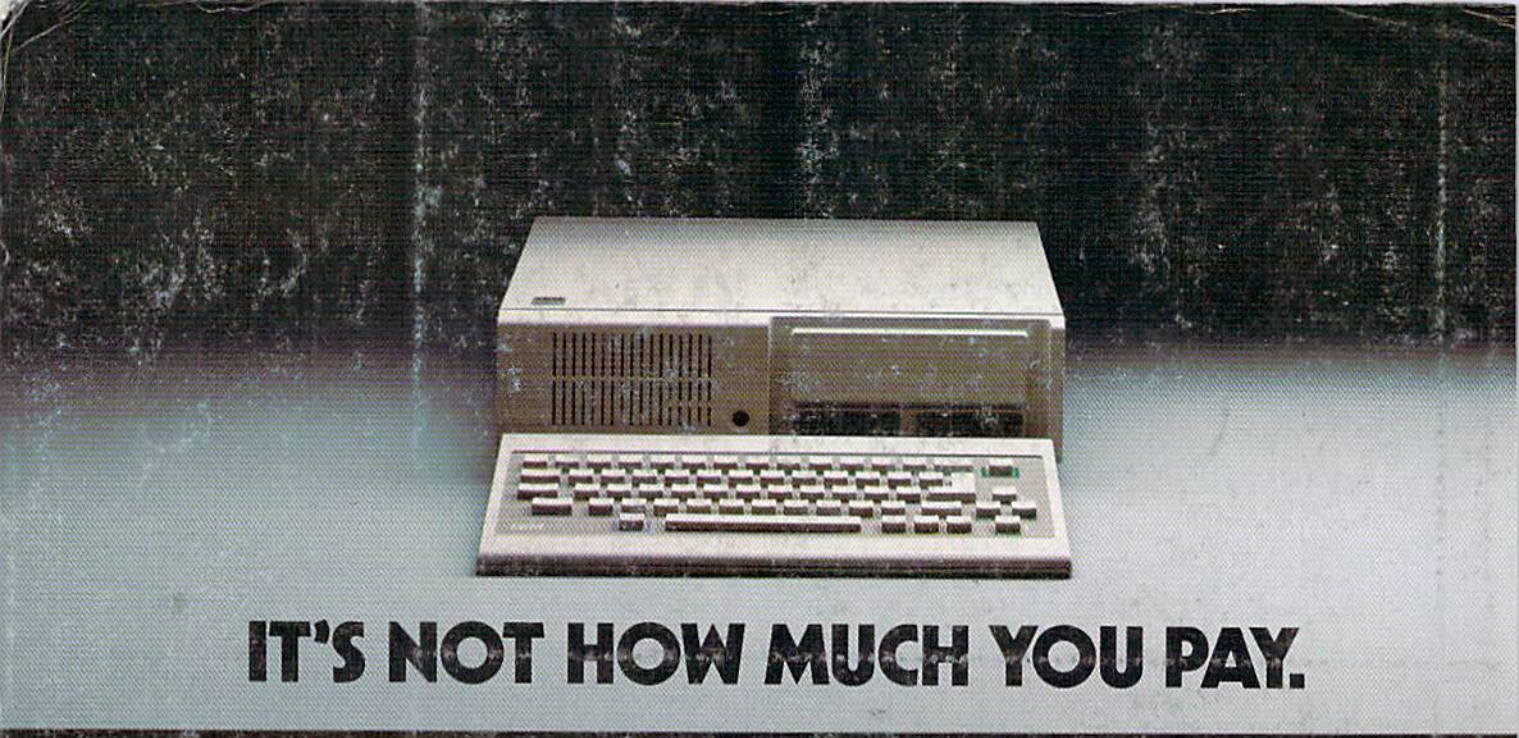

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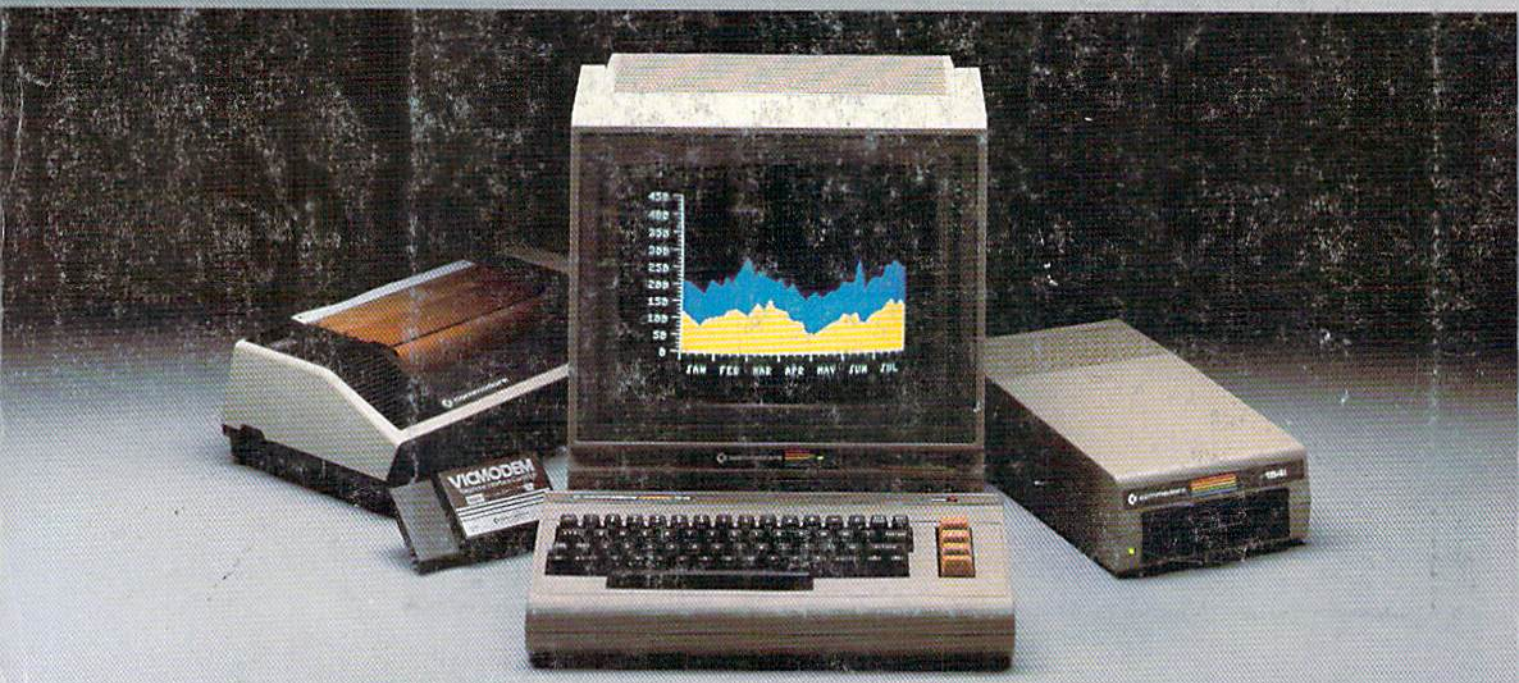

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